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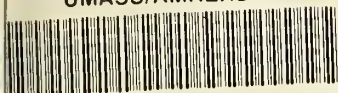
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# **The Camp at the Bend in the River**

Prehistory at the Shattuck Farm Site

*Barbara E. Luedtke  
University of Massachusetts, Boston*

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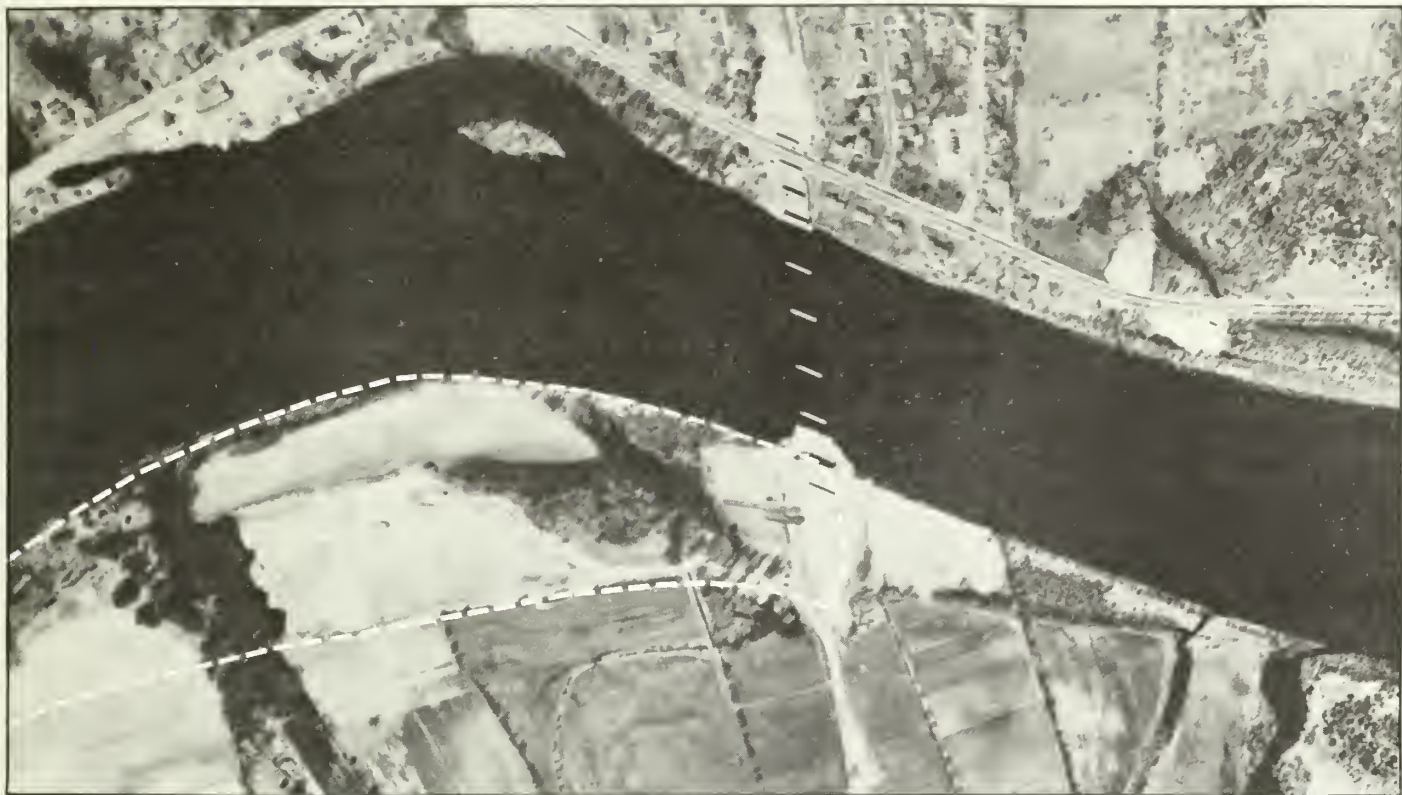
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# **The Camp** at the **Bend** in the **River**

Prehistory at the Shattuck Farm Site

*Barbara E. Luedtke*  
*University of Massachusetts, Boston*

Massachusetts Historical Commission  
*Occasional Publications in Archaeology and History*  
*December, 1985*



## ACKNOWLEDGMENTS

The Shattuck Farm project involved the aid and cooperation of a great many people, all of whom deserve considerable credit for the project's successes. Initial thanks are due to the people and institutions who provided the money that made the project possible. Primary funding for the field work came from the Catherine G. Shattuck Memorial Trust, through the kind offices of Attorneys Kenneth and David Latham. Additional funds toward this publication were donated by the Hewlett-Packard Company and by Digital Equipment Corporation, who also gave us permission to do field work on their properties at Shattuck Farm. Their assistance is gratefully acknowledged.

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The 1980 survey of the site area was ably directed by Tom Mahlstedt who, along with crew members Dave Anthony, Fred Carty, Lindy Gifford, Vicky Kenyon, Phil Salloway, and Linda Towle, braved the fierce winds of late autumn at Shattuck Farm to obtain a great deal of valuable information about the site.

Additional insights into the area were gained through discussions with people familiar with the farm and from studies of the collections made there over the years. Vicky Kenyon directed this phase of the project and I would like to thank her and all those who cooperated with her, including J. Frederic Burtt, Ralph DiPesa, M. Dupont, Ed Guilmette, Robert Hertrich, Paul Holmes, Ray Potvin, Walter Vossburg, Eugene Winter, Buttonwoods (the Haverhill Historical Society Museum), the Manchester Historic Association, the North Andover Historic Society, the R.S. Peabody Foundation for Archaeology, and the Peabody Museum of Salem.

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The long list of people mentioned above, plus many others who visited and

expressed interest in the site, demonstrate the special place Shattuck Farm holds in the hearts of the residents of Andover and of everyone interested in the archaeology of New England. I hope this report will serve to increase their respect and concern for this site by showing how much it has taught us, but also how much is still to be learned.

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THE CAMP AT THE BEND IN THE RIVER: PREHISTORY AT THE SHATTUCK FARM SITE

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## Chapter 1 INTRODUCTION

The Shattuck Farm site (19ES196), located on the Merrimack River in Andover, Massachusetts, has been used by different groups of people for thousands of years, first as a camping or village site, later as a family farm, and most recently as the setting for a "high tech" industrial park. This report will present the results of recent archaeological and historical investigations which attempted to describe and explain the changing pattern of activities at this site, with reference to the location itself and also in terms of the larger cultural systems inhabiting the Merrimack River Valley. The primary focus of this report is on the prehistoric period at the site, though the larger project included historical and architectural studies as well (Roper 1981; Steinitz 1981). However, some historical activities have had considerable influence on the prehistoric remains at Shattuck Farm, and these activities will be mentioned at various points in the report.

### THE SHATTUCK FARM PROJECT: HISTORY AND GOALS

Shattuck Farm is one of the most famous prehistoric sites in the lower Merrimack, which is somewhat surprising given the fact that only a few brief references to the site had appeared in print before the start of the present project. This was one of a number of New England sites that every amateur and professional archaeologist knows about but which have never actually been carefully investigated. As such, Shattuck Farm had been the subject of a certain amount of speculation and myth-making (Luedtke 1983), and had also suffered from some destructive digging by artifact hunters. However, Shattuck Farm's fame was also responsible for the level of concern that was quickly demonstrated when it appeared that the site was in danger of being destroyed in the course of its development into the Andover Technological Center. A number

of people and organizations immediately began to work together to launch a project which would investigate the prehistoric, historic, and architectural resources of Shattuck Farm in advance of the proposed construction. This is the second of two reports documenting the findings of this project. (See also Mahlstedt (1981), Steinitz (1981), and Roper (1981)).

The Shattuck Farm project had several goals, the first of which was simply to define and describe the site itself. Shattuck Farm had been listed in the Massachusetts archaeological site files for years, but it was necessary to verify its location, define its boundaries, assess its condition, and determine its significance. It was known that the area had been severely disturbed by a variety of activities, but we needed to know more precisely what had been lost or damaged so that we could recommend how best to preserve what remained. Part of this goal was met by the initial survey (Mahlstedt 1981), and this issue will also be addressed at the end of this report.

The second goal was to provide cultural-historical documentation of a large, complex riverine site occupied over a considerable period of time. This location has been in virtually continuous use for at least 8000 years, and has attracted hunter-gatherers, horticulturalists, farmers, and industrialists. We wanted to know which resources and locational attributes drew these different people to this site. A related issue is the extent to which Shattuck Farm can be considered a good example of the other Merrimack Valley prehistoric sites now partially or wholly destroyed by the industrial cities that grew up along the river in the nineteenth century. In addition, we wanted to know how the environmental, technological, and social changes that took place in the larger region affected the ways people used the Shattuck Farm location in particular. The continual interaction between changes in the environment and in the cultures of the people inhabiting it is reflected in the kinds of remains left behind and in the different ways people organized themselves in space. In general,

Shattuck Farm is seen as only one element in a settlement system encompassing at least the lower Merrimack River Valley, and it is assumed that the larger region must be considered in any attempt to explain events at Shattuck Farm. Shattuck Farm, in turn, may provide clues to environmental and cultural processes occurring in the larger region.

A third goal for this project was to demonstrate the usefulness of a nontypological approach to the analysis of the artifacts and features found at Shattuck Farm. This approach was used partly as a result of my own prejudices regarding the meaning of artifact and feature variability, and partly in order to make a virtue of necessity. Massachusetts archaeologists frequently bemoan the fact that formal types have not been established for many of the lithic and ceramic artifacts we find, and that space and time parameters are not clear even for those types that have been defined. The Shattuck Farm excavations did not provide enough artifacts of any one kind to contribute to the typologies we do have, and the disturbance and lack of stratification at the site meant that most of the artifacts we did find could not be dated precisely. Thus, it would have been impossible to define and establish new types, as was possible at the Neville site (Dincauze 1976) and the Wheeler's site (Barber 1982).

However, the lack of entrenched typologies in New England archaeology may actually be to our advantage, as it may allow us to bypass a stage of development that archaeologists in other parts of the world are now struggling to leave behind. Once types are established in a region they tend to act as straightjackets which disguise actual artifact and feature variability and which also seem to constrain the thinking of many archaeologists. Types are most often based on a combination of technological, stylistic, and even functional variables used to create units that do indeed perform well as space and time indicators, but which may have no other reality in terms of the societies which made and used the artifacts or features. Archaeologists elsewhere are now looking more

frequently at attributes than at types, and they are finding that attributes may provide even finer temporal and spatial resolution than types can, while also allowing the study of other aspects of prehistoric societies.

The approach used here is concerned primarily with the function rather than the form of artifact and feature variation. It is usually more interesting to explain than to simply describe variation, and in order to do so one must look for the factors that cause variation in the first place. Essentially, then, it is assumed here that artifact and feature variation results from the operation of processes related to a variety of cultural subsystems, and that any single attribute can reflect one or more of these processes.

For example, we can examine some of the factors affecting variability in a tool such as a projectile point. The stone of which the tool is made reflects the maker's raw material procurement strategy, either through exploitation of his own territory or of that of another group through trade. Raw material choice may also be influenced by the technological requirements of a particular size and shape of projectile point; aesthetic and even religious beliefs may also play roles (Gould, Koster, and Sontz 1971). Some of the projectile point's shape attributes have to do with its function as a piercing tool, while the point's size and weight are influenced by whether it was intended to tip an arrow, a dart, or a spear. Other shape attributes reflect the way the point was hafted and used. Some shape attributes reflect stylistic rules common to a particular social group, while others are the result of the skills and preferences of the individual maker.

Each of these influences on the finished projectile point is not a discrete, easily quantifiable input to the creation of the finished projectile point; the various factors, along with others, interact in complex ways and are manifested through a series of conscious and unconscious decisions on the part of the makers and users of the artifacts or features in question.

The resulting variation in artifact or feature attributes is not particularly easy to untangle, but it is necessary to try to do so in order to use archaeological remains as keys into other aspects of prehistoric life.

Thus, whenever possible (and especially in Chapter 6), analysis will begin by considering the factors most likely to have influenced the various artifact or feature attributes, and will then attempt to relate observed variation back to other aspects of the prehistoric society under consideration. I should stress that although some similar artifacts and features are grouped in this analysis, these are not meant to be equivalent to types. They are simply sets of items with some attributes in common, grouped together for convenience of discussion. They are likely to have served similar functions, but do not necessarily have any spatial, temporal, or cultural unity.

It will be obvious that the analytic approach used here results in many unanswered questions. However, it may be more valuable at this point in the development of Massachusetts archaeology to ask interesting questions than to find uninteresting answers.

#### TOPOGRAPHY AND LANDMARKS OF THE SHATTUCK FARM AREA

Further discussion of the resources, history, and archaeology of Shattuck Farm must be based on a clear understanding of the location and situation of the site. The general topography of the site will be described first; for more detail, see Appendix II. The site will then be located with regard to various geographic place names and landmarks that will be mentioned frequently in later parts of the report.

The site is located on the south bank of the Merrimack River, one of New England's largest rivers (Figure 1). The Merrimack begins in the White Mountains, flows through the uplands of central New Hampshire, drops to the lower terrain of the coastal lowlands, and finally enters the sea at Newburyport,



Figure 1. The Merrimack River Drainage. Star indicates location of Shattuck Farm Site.

Massachusetts. In all, it drains an area of some 12,970 square kilometers.

The Amoskeag Falls at Manchester, New Hampshire, mark the beginning of the Merrimack or Seaboard Lowland, a region of rolling hills with most of the terrain under 61 m in elevation. In this region, the river is not flowing entirely in its pre-Pleistocene channel, which ran south to the Boston Basin, because drift dams west of Lowell diverted it to the east. Therefore, this section of the river has not developed much of a floodplain, and most of the obvious bends in the lower Merrimack result from the river flowing around hills, not from the process of meandering. However, small alluvial terraces have developed in places along the river in this lower section. The Shattuck Farm site is located on the inside of a major bend in the river, on a series of terraces rising like broad, curved steps to the south. Archaeological remains have been found on three of these terraces.

Immediately adjacent to the river at Shattuck Farm, and rising just a few centimeters above it, is a narrow ledge which ranges from a few centimeters to 21 meters in width and is about 13-14.5 meters above mean sea level. Prehistoric materials were found in waterlogged context at considerable depth on this ledge. However, as will be discussed in Chapter 5, this ledge may be of rather recent erosional origin.

A steep bluff rises two to three meters from this ledge to the next level, which is a broad sandy terrace formed of alluvial sediments and lying at an elevation of about 16 meters above mean sea level. This terrace is 50 to 100 meters wide and extends virtually the entire length of the bend in the river, although it is narrow to the west and becomes swampy to the east. This level is generally referred to as "the first terrace" by collectors who worked at the Shattuck Farm site, and will be called the alluvial terrace in this report.

Just to the south of this broad, flat terrace was a series of kames and kame terraces topped by a ridge formed by ice-channel filling. The latter are

described by those who saw them as being composed largely of fine white sand. They apparently took the form of a curved wedge, about 35 meters wide at the east end and 100 meters wide at the western end at Spindles Creek. Based on the small remnant areas existing at the eastern and western ends, the elevations of the northern edge of this terrace varied from 19 meters above mean sea level at the western end to 16.5 meters at the east. Collectors refer to this area as "the second terrace", and it will be called the kame terrace in this report.

South of the kames, the land at Shattuck Farm rises steadily to elevations of over 49 meters just southwest of the farm area. Other hills and overlooks lie across the river to the north, and in a line of hills running from north to south just east of the site. These hills are part of a complicated kame and esker system and have a marked effect on drainage to the east of the site. The site is thus surrounded by higher ground in an arc from the southwest to the northeast.

In terms of modern boundaries and landmarks, Shattuck Farm is located in the West Parish of the town of Andover, near the northwest corner of Essex County, Massachusetts. It lies between the modern cities of Lowell and Lawrence. The actual boundaries of the Shattuck family property have changed considerably over time (Steinitz 1981), but for present purposes "the Shattuck Farm" is considered to be that area bounded by Old River Road on the south, by Interstate 93 on the east, by the Merrimack River on the north, and by Brundrett Avenue and the west fence of the Hewlett-Packard property on the west (Figure 2). All of the above roads (except Interstate 93) appear on old maps of the area, along with Laurel Lane, which used to run north from River Road to Laurel Grove, a small cluster of cottages near the river on the west side of the Shattuck Farm. The present Hewlett-Packard access road follows part of Laurel Lane.

A series of other landmarks, mostly hydrologic in nature, will be referred

# SHATTUCK FARM SITE PLAN

- Major prehistoric areas
- Stone walls
- Drainage ditches
- Wetlands
- Tree cover
- Dirt tracks
- Limits of severe disturbance

Merrimack River →

Locus E

Locus D

Locus C

Locus B

Locus A

Sedimentation  
Pond

Filtration  
Bed

Locus H

HEWLETT-PACKARD

N

Brundrett Road

River Road

0 100 200 meters

Figure 2. Shattuck Farm Project Area.

to repeatedly in subsequent discussions. The many falls on the Merrimack have been important, for different reasons, to all the people who have lived along the river. The Merrimack cuts through glacial and alluvial sediments for the most part, but it strikes bedrock in numerous places, forming falls or rapids that range in height from mere ripples to the 16.5 meter falls at Amoskeag. All of these falls have been modified by the many dams built on the river in the last 150 years and many are drowned, but it is important to reconstruct their locations because of their significance to prehistoric inhabitants of the area.

If Amoskeag is the greatest of the falls on the Merrimack, the most important in the Lower Merrimack region is certainly Pawtucket Falls, located 12.7 kilometers west of Shattuck Farm. The Lowell dam was built to harness the energy of this cascade, which drops a total of 9.5 meters through various chutes and channels. A second important drop, Hunts Falls, is still visible about 2.25 km east of the Pawtucket Falls, and then a series of minor falls and rapids hampered early historic navigation along the Merrimack through the rest of its downstream length. The first of these was Deer Jump Falls, which is now drowned and its location not certainly known. It was probably minor, and very likely to have been located near the present Deer Jump Reservation, immediately west of the Shattuck Farm project area.

Next downstream was Peters Falls, located adjacent to Shattuck Farm and now inundated by the waters ponded behind the Lawrence dam, so that its exact location is not visible. However, Peters Falls is shown in relation to some modern landmarks on the 1830 map reproduced in Steinitz (1981:9). Here it is shown almost due north of the main farm buildings, which lie at the eastern end of the property along Old River Road. Wadsworth (1878:43) states that there was an island at the head of Peters Falls, and there is a very small island, Ivy Island, located just west of the bridge over which I-93 crosses

the Merrimack. In addition, Sears (1905:map) shows bedrock outcroppings just south of the river at this location which are probably part of the bedrock sill that formed the falls. It is therefore most likely that Peters Falls lay at or close to the location where I-93 now crosses the river. It was probably not a spectacular waterfall, as it is said to have been "several feet" lower than Bodwell's Falls (Wadsworth 1878:43), which is said to have dropped only about five feet (1.5 m) (Molloy 1980:330). Bodwell's Falls, located under the present Essex Dam in Lawrence, is 4.1 klm downstream from Peters Falls. This is the last major fall until Mitchell's Falls in present Haverhill, near the beginning of the Merrimack estuary.

Tributaries of the Merrimack provide access to other parts of New England for people traveling by watercraft, and also access to spawning grounds for many fish. The major tributary upstream from Shattuck Farm is the Concord River, which flows into the Merrimack from the south through present-day Lowell. Fish Brook, which drains Haggetts Pond and enters the Merrimack at Pine Island, lies just off the west end of the project area. Numerous small streams enter the Merrimack from the north and south along its full length, and one such is the small stream we called "Unnamed Stream", which now flows from a sedimentation pond on the Hewlett Packard property into the river. A somewhat larger drainage feature near the center of the project area is Spindle's Creek, which once extended nearly all the way back to River Road. It is less extensive now, and has been dammed at its northern end into a small stagnant pond.

At the east end of the project area is a freshwater marsh with a pond in it known as Shattuck's Pond. This marsh was bisected by the construction of I-93, and continues east of the highway for a length of about .5 klm along the river. Finally, the major tributaries downstream from Shattuck Farm are located in modern Lawrence, where the Spicket River flows in from the north and the Shawsheen River enters from the south.

The last important landmarks to be mentioned here are the present property boundaries. The Hewlett-Packard Company controls the western half of the project area, while the Digital Equipment Corporation controls the eastern half. A 33 meter wide strip of land all along the river at the north end of the project area is held in trust as a Conservation Easement by the Town of Andover, and is overseen by the Andover Conservation Commission.

## Chapter 2      RESOURCES OF THE LOCALITY AND THE REGION

This chapter will discuss resources available in the immediate vicinity of Shattuck Farm, as well as those available in the wider region. The availability of some resources may have changed over time, and if so, this will be mentioned. The ways in which various resources were used by the prehistoric inhabitants of Shattuck Farm will also be briefly mentioned, as a basis for understanding their importance. Finally, there will be discussion of the significance of some of these resources with regard to the specific location of the Shattuck Farm site.

### LITHIC RESOURCES

Shattuck Farm is located at the southern end of the Rockingham Anticlinorium, which is bounded just south of the site by the Clinton-Newbury Fault Zone (Billings 1956). The site itself is underlain by the metamorphosed quartzites of the Merrimack Group, probably Silurian/Devonian in age (Fessenden et al. 1975). There are no outcroppings of this bedrock visible at the site today, and bedrock was never encountered in our testing, even at depths of four meters below present ground surface. However, it must have been exposed at Peters Falls, and outcrops may underlie the footings of I-93 (Sears 1905).

Merrimack Quartzites vary considerably over their wide outcrop area in northeastern Massachusetts and southeastern New Hampshire (Billings 1956), but those found in glacial gravels at the Shattuck Farm site are fairly fine-grained, yellowish grey, and range in their degree of metamorphism from slaty types to mica quartz schists. All are too soft and crumbly for most flaked or ground stone tools, but Merrimack Quartzite was used for hammerstones, abraders, and in and around fires.

To the north and west of Shattuck Farm the Merrimack Quartzites are cut by northeast/southwest trending bands of intrusive Dracut Diorite, Ayer Granodiorite,

and various minor granites (Billings 1956). These materials can be found in the glacial deposits on the site, and probably were available in the riverbed in the past. They were used for some ground stone tools, for hammerstones, for fire rocks, and they were also crushed to provide temper for pottery.

All of these formations have been cut by numerous veins of intrusive quartz, which range in quality from fractured and poor to homogeneous and fine, and in color from clear to milky to grey, pink, or yellow. These varieties of quartz are available in gravels and from the river bed, and were used by the prehistoric inhabitants of the site for flaked stone tools as well as for hammerstones and fire rock. An unusual and distinctive vitreous grey quartz found in the debitage at Shattuck Farm may have been derived from the Ayer Granite, which underlies the area just to the west of the site (Gore 1976:341).

Quartzite other than Merrimack Quartzite makes up a very small proportion of the debitage from the site, and argillite is only slightly more abundant. In addition, slate was used for several types of ground stone tools. All of these materials may have been found in glacial gravels, but it is more likely that they were brought in from sources upstream, from the Concord drainage, or from the Boston Basin.

Graphite, a naturally occurring crystalline form of carbon used as pigment, is relatively common at the site and may have been a locally available resource. Graphite is found in the Tadmuck Brook Schist, which underlies sediments just south of the Clinton Newbury Fault from Worcester to Lowell, and perhaps as far east as Lawrence (Alvord et al. 1976, Bell and Alvord 1976). Graphite is not mentioned in southern New Hampshire geologic references (Meyer and Stewart 1956) so it is assumed here that small fragments were obtained in glacial gravels south of the site area, or in gravels carried by the river downstream from Lowell. The nearest major bedrock source of graphite is apparently near Worcester (Morton 1883:219).

Other lithic materials used by the prehistoric inhabitants of Shattuck Farm were not available in the immediate vicinity of the site, and had to be brought in. Some probably were found in other parts of group territories, while others must have been obtained by trade. It is not possible to say what proportion of the quartz found here was local, but it is certain that all the volcanic materials found as chipped stone tools or debitage were non-local in origin. These range from homogeneous rhyolites to porphyritic felsites, and in color from pale buff through red and purple to grey or black. The latter dark colors predominate in the Shattuck Farm assemblages.

The nearest sources of such materials are the Newbury Volcanics, which are exposed in numerous surface outcrops near and to the south of the Parker River, beginning 25 kilometers east of the Shattuck Farm site (Shride 1976). Published descriptions and my own field collections from these outcrops indicate considerable variation, with materials ranging from rhyolitic tuffs to aphanitic andesites, basalts, porphyries, and siltstones. Most tend in color toward olive green, but some are buff, purple, or pink. Some would be suitable for knapping, although many are too coarse-grained. A purple banded variety is very similar to materials seen in debitage from the site, but I am unwilling to make definite attribution in the absence of more testing.

The Lynn Volcanics outcrop just 30 kilometers to the southeast of the site, and are the source of the many black, grey, red, and purple felsites used so commonly throughout the Boston Basin (Haynes 1886). Saugus "jasper", actually a rhyolite and an intrusive member of the Lynn Volcanics, is also found in this general area.

The next nearest source of volcanic materials is that of the dark blue-grey rhyolites of the Mt. Pawtuckaway Ring Dikes, 37 kilometers to the north of the Shattuck Farm site (Lalish 1979). Further north, light to dark grey and pink-buff rhyolites, andesites, and basalts form the Belknap Ring

Dike complex are available near Lake Winnepesaukee, 80 kilometers from Shattuck Farm (Billings 1956, Lalish 1979). Glacial movement was from the northwest to the southeast in this region of New England, so these northern volcanics could not have been carried to the vicinity of the Shattuck Farm site through glacial action. Furthermore, no volcanics were seen in gravel deposits at or near the site. There are more distant sources of volcanic materials at the south end of the Boston Basin and up in Maine, but most of the materials seen in debitage from the site can be accounted for by the closer sources mentioned above. In absence of any secure proof, I suspect most were from the Lynn and Newbury Volcanics.

Steatite or soapstone, traded widely throughout the northeast and used for stone bowls during one period and pipes or pendants during others, is found in small quantities in the Shattuck Farm assemblages. Bullen (1949:5 and 61) describes a source of impure steatite northeast of Martins Pond, to the south of Shattuck Farm, but he says there is no evidence that the source was used by prehistoric people. The nearest major known quarries are apparently those south of Worcester, about 80 kilometers southwest of Shattuck Farm (Fowler 1966b).

Finally, a few cherts appear in the Shattuck Farm assemblages as debitage and flaked stone tools. Some appear to be Hudson Valley types from 200 kilometers or more to the west, while others are true jaspers, possibly from a source in Rhode Island, 100 kilometers to the south, but more likely from the major quarries in Pennsylvania, 475 kilometers to the southwest (Leudtke 1982).

The availability of lithic resources in general is unlikely to have changed greatly in the last 8000 years. Therefore, variation in the raw materials used by different cultures must have been the result of technological choices, or of social factors limiting or facilitating access to the various materials.

## SEDIMENTARY RESOURCES

The Shattuck Farm soils are all glacial and alluvial in origin. The alluvial terrace along the river is composed of the droughty, sandy Windsor soils, with some areas of Deerfield soil to the east and west (Fuller and Hotz 1981). The kame terraces are mostly gone, but remnants and old soil maps suggest that the soils on them were Merrimack types. The marshy areas adjacent to streams in the project area have poorly drained Saco variety and Pipestone loam soils (Fuller and Hotz 1981). The Windsor and Merrimack soils provided well-drained, comfortable, level areas for camping, and are suitable for farming. These various soil types also supported a variety of vegetation types, as will be discussed below. They are all relatively acid soils, though, ranging in pH from 4.5 to 5.5 for Windsor soils, from 4.5 to 6.5 for Deerfield soils, and from 3.6-6.0 for Merrimack soils (Fuller and Hotz 1981).

Lenses of clay appeared in deep cuts excavated up the center of the property when sewer pipes were recently laid, according to Eugene Winter (personal communication). They were at depths of about 60 cm below the ground surface at the eastern end of the site project area, and somewhat deeper to the west. Some of these lenses could have been exposed in the river bluff. It is not known whether they were of sufficient quality for prehistoric pottery manufacture, however. Beds of clay are said to have been found in the kame and esker hills running to the east of the project area (Bullen 1949:5).

As with lithic resources, sedimentary resources are unlikely to have changed substantially over the time period under consideration. Specific pockets of clay may have been exhausted, and extensive human activities at the site would certainly have altered its soil chemistry to some extent, but these changes probably did not affect the primary characteristics of the location.

## RIVERS AND STREAMS

Shattuck Farm is obviously a well-watered location, with a major river, numerous secondary watercourses, and a wetland area. The Merrimack itself can be considered a major resource because of the many species of animals resident in and near it, and because its configuration at this location made it a natural trap for fish migrating upstream. The falls here were apparently less than 1.5 m in height, but even this elevation would have produced an impediment which would have caused the fish to bunch up and circle where they could be easily caught.

The same falls provided another advantage for human occupants of the area, as they made the river fordable here (Fuess 1959). The low falls or rapids probably would not have been a major barrier to canoe transportation down the river, but may have necessitated portaging for upstream travel.

The Merrimack was a major transportation route for this whole part of New England, and its tributaries provided access to an enormous area. To the north, the Merrimack drainage includes the White Mountains and many lakes, including Lake Winnepesaukee. Tributaries of the Merrimack are close to tributaries of the Piscataqua on the east and the Connecticut on the west. To the south, the Concord, Sudbury, and Assabet rivers run close to the west side of the Boston Basin, and to rivers that flow into Boston Harbor. It has been said that in the spring, when marshes are full of water, it was possible to travel by canoe from the Merrimack to the Charles to the Neponset and down through Taunton into Narragansett Bay, traversing the whole of southern New England (Bullen 1949:6).

The Merrimack is also subject to flooding, which provided a mixed blessing for prehistoric people living near the river. There is a long record of serious flooding along the Merrimack, ameliorated only recently by numerous dams all along the river's length. Prior to the construction of these dams, flood waters were known to reach heights of up to six meters above normal river levels,

causing considerable property damage. Most of these floods are the result of the spring thaw and run-off, but some are caused by storms or hurricanes. Records show that eight of the 10 greatest floods recorded at Lawrence from 1852 to 1938 came in March and April. The other two fell in September and November, and were probably caused by hurricanes (Corps of Engineers 1972:6). While most of the Shattuck Farm project area showed little obvious evidence of flooding, the wetlands at the east end have clear flood deposits. Other areas may have been very wet at times; water levels well up the bluff from the river ledge were observed during the spring of 1981 (Kenyon, personal communication). While flooding would have made some areas of the site unsuitable for camping in the spring, it would also have created backwater ponds and wetlands with numerous resources of interest to prehistoric peoples.

The Merrimack has changed considerably since this area was deglaciated between 13,000 and 14,000 years ago. Its original channel ran south, into Boston Basin, but drift dams west of Lowell caused it to swing east and cut an entirely new channel through glacial and outwash deposits (Sears 1905). It is likely to have cut down to some bedrock sills by at least 8000 years ago (Dincauze 1976). There would have continued to be some changes in river velocity because this attribute is controlled partly by sea level, and the Merrimack may have run faster until sea level stabilized about 3000 years ago (Barber 1979). In its most important characteristics, though the Merrimack can be considered to have changed little through most of the period under consideration.

Secondary streams entering the Merrimack also provided habitat for plant and animal species, and may have been the actual spawning places for some anadromous fish. Besides the major streams shown in Figure 2, Shattuck Farm apparently had a number of springs, some of which had to be diverted or canalized in historic times so that they would not periodically flood the fields. Springs

and streams also help feed the freshwater marsh, which is an important habitat for many species.

These secondary water sources and wetland areas are likely to have fluctuated significantly through time. This region has a high water table, and groundwater supplies most of the water to streams. Therefore, fluctuations in groundwater are accompanied by fluctuations in streams and in wetland areas. A recent environmental impact study for this district states, "Thus we find throughout the corridor a relatively extensive system of surface water and groundwater tied together in a recharge and discharge relationship." (Department of Public Utilities 1976:107). Fluctuation in ground water must have occurred annually, and there may have been long-term changes in the distribution of wetlands, the amount of flow in streams, etc. These changes are very difficult to document with available data, but should be kept in mind when considering prehistoric use of the area.

#### PLANT RESOURCES

This region was covered in the past by a mixed deciduous coniferous forest whose dominant trees were red oak (Quercus rubra), white oak (Quercus alba), ash (Fraxinus americana), hickory (Carya sp.), birch (Betula sp.), American chestnut (Castanea dentata), hemlock (Tsuga canadensis), white pine (Pinus strobus), red maple (Acer rubrum) and black cherry (Prunus serotina) (Department of Public Utilities 1976). All but chestnut can still be found on the site area today. These trees provided firewood, nuts, and bark to the human inhabitants of the Shattuck Farm area, and also provided food and shelter for many animals. This area is near the southern limit of the paper birch, and birchbark for canoes and containers would have been an important resource.

A wide variety of berries, roots, and ferns would have been available for food, as would many plants used for medicinal purposes (Yarnell 1964, Harris 1975).

The wetland areas would probably have been the most productive in this regard, (Department of Public Utilities 1976:118) and could have produced lily roots, cattails, reeds, rushes, and hemp. Some of these can be eaten, while others provided raw materials for baskets, mats, cordage, nets, and other important manufactured goods.

The distribution and frequencies of the different arboreal and herbaceous plants must have changed considerably over the long period of occupation here because of climatic factors, groundwater fluctuations, and also because of human activities. Burning of areas to clear out undergrowth and to encourage growth of grasses is a well-documented practice in the region during the Contact period (Day 1953), and one that undoubtedly has considerable time depth. Regular settlement at the site would have resulted in substantial clearance for firewood and for posts for construction, and settlement probably also altered distributions of smaller plants because of exploitation patterns or changes in soil chemistry resulting from human organic debris.

#### ANIMAL RESOURCES

Sedimentary, water, and plant resources all combine to produce habitat for animals, which must have been abundant in the vicinity of Shattuck Farm. Fish are both a permanent and seasonal resource in the area. Freshwater fish available year round in the Merrimack and its tributaries included chub, dace, various minnows, bass, perch, pickerel, and occasional brook and lake trout (Marston and Gordon 1938:188). The common eel also may count as a year-round resident of most areas of the Merrimack. Some of these fish may have been swept into pools and ponds by spring floods and trapped there for easy catching (Limp and Reidhead 1979), and the ledges and rocks at Peters Falls also probably provided excellent places for catching freshwater fish.

Anadromous fish were probably more important as a food resource, though,

because of their tremendous seasonal abundance. The Merrimack was a famous fishery until the mid 1800's, and much documentation exists for the enormous quantities of fish taken there in the early historic period (Stolte 1981; Marston and Gordon 1938). Table 1 shows the most important anadromous fish taken in the Merrimack, along with their spawning seasons and their general size ranges. Changes in anadromous fish populations over time are difficult to document prior to the historic period, but some trends may be suggested. Dincauze argues that anadromous fish were established in the Merrimack at least by Middle Archaic times (Dincauze 1976), but it is likely that their quantities increased as the continental shelf was flooded and the rich offshore feeding banks became available. Changes in species also probably occurred, as a function of changes in the ocean's temperature (Braun 1974). Anadromous fish do vary in abundance on an annual basis, but even in poor years they should have been plentiful at Shattuck Farm because of the site's location on the main trunk of the river system (Moore and Root 1979).

Freshwater clams do not live in the river now because of the dams and the pollution levels, but they are a possibility for the past because they like shoaly areas with sandy and gravel bottoms. Barber states that the acidity of New England waters is inimical to freshwater clams (Barber 1979:87), but they are known to have been living during the prehistoric period in rivers that are tributary to the Merrimack (Smith 1940). Marine shellfish, especially soft shell clam and oyster, were available in the estuary, 40 km downstream.

Reptiles and amphibians of several sorts can be found in the area today, especially in the marsh. Frogs, snakes, and turtles were probably eaten, and some may have had technological uses as well. Snake skins were used for belts by Indians during the Contact period (Wood 1977:84), and turtle shells were used for cups, bowls, and rattles. Most of these reptiles and amphibians hibernate in winter and emerge when the ground warms in the spring. Some are

Table 1. Major anadromous fish species of the Merrimack  
(Bigelow and Welsh 1925)

<u>Common name</u>	<u>Scientific name</u>	<u>Availability</u>	<u>Size</u>
alewives	<u>Pomolobus pseudoharengus</u>	early April on into June, peak in May	1/2 lb.
lamprey eels	<u>Petromyzon marinus</u>	end of April to June, peak in June	3-5 lbs.
shad	<u>Alosa sapidissima</u>	mainly May and June	5-8 lbs.
salmon	<u>Salmo salar</u>	early April on into July, with peak in June	9-12 lbs.
sturgeon	<u>Apincenser sturio</u>	May and June	65-350 lbs.

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diurnal during the cooler periods of spring and fall, and nocturnal during the hot summer months (Porter 1972:296). Thus, while they could have been collected at virtually any season, they were probably most available during spring and fall.

Birds, including songbirds, wild turkey, grouse, pigeons, ducks and geese would have been available year round, but would have been especially abundant during the fall migrations, when many would have been attracted to the river, the streams, and especially to the marsh as a resting place. The major spring migration routes lie generally to the east and west of Shattuck Farm, so the spring migration was probably not as important as the fall (Griscom 1949:143). Birds were probably captured primarily for food, though bird bones were also used for awls and beads, and bird feathers for decoration and in some crafts.

The wetlands and hills around Shattuck Farm would also have provided habitat for numerous mammals. Most of the larger animals once found in the Andover area are gone now, including bear, wolf, beaver, and moose. Deer can still be found on the site today, however, as can raccoon, muskrat,

woodchuck, skunk, squirrel, fox, and New England cottontail rabbit. All were probably hunted by prehistoric inhabitants of the site, both for their food and their skins. Many would have been available year round, though some do hibernate in winter. Fall is the optimal time for hunting fur-bearing animals if quality of the fur is a consideration.

#### CLIMATE

The climate of northern Essex County in general is typified by cold winters with an average minimum daily temperature of 30°F, and warm summers with an average daily maximum of 79°F (Fuller and Hotz 1981:1). The average annual precipitation is 43.2 inches (109.7 cm), and precipitation falls fairly evenly through the year. Prevailing winds are from the northwest, and windspeed reaches its average maximum of 14 miles per hour in winter. Recent measurements have shown that the temperature stays above freezing for 135 days in nine out of 19 years, and for 166 days five years in 10 (Fuller and Hotz 1981), so there is a reasonably long growing season. During our 1980 survey in the late fall it appeared that the Shattuck Farm area in particular stayed a bit warmer than adjacent areas, and crops in the fields were still harvestable as late as November.

#### ANALYSIS OF THE LOCATION

Shattuck Farm is a lovely location with abundant resources of many types. However, a "laundry list" of available resources can only be meaningful if a location is being compared with others, or if resources can be broken down into quantities available, as in a site catchment analysis. Lack of data makes the latter type of analysis impossible now, but Shattuck Farm can still be compared with other riverside locations. Most of the resources listed above are available all along the Merrimack and its major tributaries, yet we know that

people did not settle evenly throughout that zone. Use of the Shattuck Farm area itself was focussed on just a few locations (Mahlstedt 1981), and surveys have found other riverside areas to be lacking in prehistoric sites (Bullen 1949, Barber 1979). Furthermore, based on the projectile points found there, Shattuck Farm has been occupied without any major gaps over a long period of time, in contrast to other sites in the region (Bullen 1949). Only the Amoskeag area has produced as many different types of projectile points (Dincauze 1976; Foster, Kenyon, and Nicholas 1981). What factors made this particular location so unique and attractive to prehistoric people?

Shattuck Farm does fit the profile for areas with a high probability of site encounter reasonably well. Studies of site locational characteristics in New England (Dincauze and Meyer 1977) and elsewhere in the east (Roberston and Robertson 1978) have found that prehistoric sites are usually located on level, well-drained soils close to travel routes and to sources of food and water. Special resources, such as a quarry, sometimes caused people to choose less optimal locations, or provided additional incentive to visit "good" locations. Kenyon and McDowell's study of site locations in the Merrimack drainage suggest falls and wetlands are two such "special attractions" for this region (Kenyon and McDowell 1983). Collector wisdom adds that sites often have a southern exposure, for warmth, and are usually sheltered from strong winds, especially those from the northeast that bring the most severe storms.

These general criteria are also met at a large number of locations along the Merrimack and its tributaries, however, so it may be more productive to examine the locational attributes of Shattuck Farm in more detail. In terms of transportation, Shattuck Farm is certainly located on the major route of the region. However, the best locations would presumably be at transportation crossroads, and in particular at confluences of major tributaries with the Merrimack. It is possible that there was a path across the ford at Peters

Falls, but Price's map of New Hampshire trails does not show any trails coming from the Shattuck Farm area (Price 1958). Therefore, in terms of transportation, Shattuck Farm was good but not optimal.

The site's riverside location guarantees that it is well provided with fresh water, but people are often choosy about their drinking water. Mourt's Relation states that the Indians of the Plymouth area preferred to drink only from fresh springs (Mourt 1963:64). This preference for smaller, fresher, and purer water sources is also supported by the pattern of settlement at Shattuck Farm, which is almost invariably most intense near secondary streams (Mahlstedt 1981). Still, as discussed above, numerous springs and small streams are typical of the entire lower Merrimack area, so their presence here does not make Shattuck Farm more attractive than many other locations.

In terms of shelter from the elements, Shattuck Farm is decidedly suboptimal. It does not face the south, though Fairbanks has already indicated that this is not as important a determinant of site location as had been assumed (Fairbanks 1980). While there are distant hills to the north, east, and south of the site, they provide little shelter from winds and there is no protection at all from the prevailing northwest winds, which can be bitterly cold even in summer when they sweep across the river. In terms of shelter alone, the north bank of the river would appear to have been a superior location for camping. However, the north shore of the river at this location is on the outside of the river's bend, and therefore subject to more erosion and flooding than the inside of the bend, where deposition is more likely to occur.

Food resources cannot be fully evaluated in the absence of a site catchment analysis and careful control over the changes that have occurred over time in the area. However, we can safely say that there have always been a diversity of habitats in the area. Study of the soil maps indicates that most patches of a given soil type in northern Essex County only average 200 meters across, and

and that a walk of one kilometer in any direction will take one to a different soil type (Fuller and Hotz 1981). The authors of the soil study indicate that there is actually far more diversity of soils than the maps can indicate, and the many small differences in aspect, slope, etc. would further increase the diversity of habitats available. In other words, Shattuck Farm probably had a fairly patchy environment, but so does the rest of northern Essex County.

Maps of the area also indicate that areas of freshwater marsh are scattered liberally throughout Essex County (Fessenden et al. 1975). The marsh at Shattuck Farm is far from the largest in the area, but it does appear to be one of the largest adjacent to the lower Merrimack itself. The marsh has already been described as a rich shelter for many species of animals and plants, and may also have been used as a refuge for people when they wished to hide themselves from their enemies. Also, Wood points out that marshes were important as sources of brushy plants what were unavailable elsewhere because of the practice of burning undergrowth regularly (Wood 1977:38). Thus, the marsh is a special resource that certainly increased Shattuck Farm's attractiveness to prehistoric people, and its size sets it apart and a little ahead of other similar locations.

Another important special resource was almost certainly the falls located adjacent to this site. Kenyon and McDowell (1983) found that most sites along the Merrimack were located near such falls or rapids, and this fact should not be surprising, given the abundance of food available with relatively little effort at such locations during the spring anadromous fish runs (Moore and Root 1979). However, Peters Falls was far from the best fishing location on the river, as the fishes' upstream progress was much more greatly impeded by steeper falls such as those at Pawtucket or Amoskeag. Shattuck Farm did have the advantage of being located between two sets of falls, with Peters Falls to the east and Deer Jump Falls to the west. Fish resting from their jump up

one set and preparing to ascend the other may have pooled immediately adjacent to the site, making them easy to catch. However, even in this regard, Shattuck Farm would have been inferior to the stretch of river between Hunts Falls and Pawtucket Falls, just 10 kilometers upstream.

A final important factor is soil type, and here Shattuck Farm does indeed have the well-drained level soils considered optimal for camping areas. However, it was possible to consider this factor in more detail because a large sample of Merrimack River valley sites for which soil type had been determined was kindly made available to me by Victoria Kenyon. This sample had to be restricted to those sites located on soils discussed in Fuller and Hotz (1981), but it still includes 52 sites. Table 2 shows these data, with cases grouped into four soil categories: excessively drained, well-drained, moderately well-drained, and poorly drained. The proportion of all soil in northern Essex County composed of the types in each category was taken from Fuller and Hotz (1981) as a rough indication of each soil category's frequency in the area. In addition, a sample of soils from immediately adjacent to the Merrimack River through its lower length was taken from the soil maps, to determine each category's representation among riverside soils. Finally, the proportion of sites in the sample found on soils belonging to each category was calculated.

The results show that while excessively drained soils are reasonably common along the river, they have a disproportionately large number of prehistoric sites located on them. Site frequency drops dramatically for well-drained soils, even though these do make up the majority of level soils along the river. The number of sites on poorly drained soils is somewhat surprising, but each case would have to be examined in detail to determine whether this phenomenon results from changes in local hydrology, dry season camps in seasonally flooded areas, or coding error.

The key to this correlation between settlement and soil category must

Table 2. Merrimack Valley Soil Types and Site Locations

Soil types with less than 8° slope	% of all soils in northern Essex Co.	% of all level soils along lower Merrimack	% of all sites (N=52)
Category 1: Excessively drained soils	9.4	19.3	57.7
Category 2: Well-drained soils	7.3	51.4	17.3
Category 3: Moderately well drained soils	13.6	18.2	5.8
Category 4: Poorly drained soils	21.2	9.1	19.2

Category 1 = Carver, Hinckley, Merrimack, and Windsor soils.

Category 2 = Agawam, Canton, Charlton, Hadley, Melrose, Montauk, Paxton, Suffield, and Unadilla soils.

Category 3 = Amostown, Belgrade, Buxton, Deerfield, Elmwood, Ninigret, Scituate, Sudbury, Sutton, Winooski, and Woodbridge soils.

Category 4 = Ipswich/Westbrook, Limerick/Rumney, Medisaprists, Mucky peat, Ridgebury/Leicester, Saco Variant, Swanton, and Whitman soils.

lie in factors that would have been easily perceptible to people who were not soils specialists. I am not convinced that the average person can tell the difference between excessively drained and well-drained soils, but this distinction would be reflected in other properties and characteristics of such soils. In examining the various soil properties as discussed in Fuller and Hotz it is striking that only Hinckley, Windsor, and Carver soils are described as "poor" for each of the three habitat categories defined: wetland, woodland,

and openland (meadow, cropland, etc.). In fact, where the elements making up these habitat types are broken down, these soils are described as "poor" for all except wild herbaceous plants, for which they are "fair." Merrimack soils are a little better; they are described as "very poor" for wetland habitat and "fair" for openland and woodland. In contrast, soils in categories 2 and 3 are described as "good" for openland and woodland habitats, and "poor" for wetlands. Other attributes of these category 1 soils clarify why they are not very good for most types of vegetation. They are generally acid, extremely sandy, and highly permeable, and thus plants with shallow root systems are liable to get insufficient water to thrive. It is undoubtedly significant that sprinklers are used with the vegetable crops in the Shattuck Farm fields today. Seedling mortality is also listed as high (Fuller and Hotz 1981), so trees have a difficult time becoming established on these soils.

I would suggest that locations having excessively drained soil types may have had less dense vegetation, or may even have been natural clearings in the forest, and thus attractive to human settlement because they needed minimal clearance. In addition, settlement on such soils would be unlikely to disturb plant and animal resources that were especially valued. This hypothesis would also explain why so many Massachusetts sites were used repeatedly by cultures of very different types and time periods. Resources may change, water table may fluctuate, and soil chemistry may alter, but soil permeability will probably remain constant, and thus excessively drained soils are likely to have remained consistently more free of vegetation than less permeable soils.

In summary, Shattuck Farm apparently owes its continuous substantial occupation by prehistoric people to its level, sandy soils and to its location adjacent to both falls and wetlands, along a major regional transportation route. No single factor sets this location apart from many others in the

region, but it has a great many different attractions, and would have been productive in nearly every season of the year. On the other hand, similar intensity of occupation must have occurred at other locations along the river, and those locations near higher falls and at confluences with major tributaries were surely used even more intensively. Unfortunately, these same characteristics also attracted early industrialists in the Merrimack valley, and most such locations are now under urban centers. In other words, the full significance of Shattuck Farm could best be properly evaluated if we had access to comparable assemblages from under the present cities of Lawrence and Lowell.

## Chapter 3      HISTORY OF THE SHATTUCK FARM SITE

### LAND USE

An economic and social history of the Shattuck Farm has already been published (Steinitz 1981) and therefore this chapter will focus on those aspects of Shattuck Farm's history that have resulted in modification of the site area. Though this site appears to be open and pristine compared to the adjacent urban areas of Lawrence and Lowell, there has still been considerable disruption. An understanding of this disturbance will be crucial to the interpretation of the archaeological remains.

It is necessary to note that disturbance of the site must have begun well back in the prehistoric period. In areas of New England where soil build-up is slow and sites are occupied repeatedly, there is bound to have been mixing of artifacts from different time periods simply as a result of normal scuffling and trampling processes. Construction of features such as hearths and pits would have resulted in even more disturbance. We also should not discount the possibility that prehistoric people intentionally hunted for artifacts from earlier periods, in order to reuse them or for amulets or curios. When horticultural practices became widespread in New England there may have been even more site disturbance, and the higher organic content of midden soils may have made them desirable farming soils as well. The effects of such prehistoric disruptions are difficult to evaluate at Shattuck Farm because of the much more obvious disturbances of the historic period, but they should be kept in mind as a possible explanation for some anomalous findings.

Neither the ethnohistorical nor the archaeological data suggest a substantial native settlement at Shattuck Farm during the Contact period, although the area was being used as a burial ground then. In fact, these two kinds of activities may have been more or less mutually exclusive, as

early histories indicate that New England Indians deserted and avoided areas where there had been deaths and burials (Morton 1883:170). Nevertheless, early histories do indicate considerable Indian traffic up and down the Merrimack River during the 17th and early 18th centuries, and it is not unlikely that some of these travelers camped briefly at Shattuck Farm.

Not all this travel was for peaceful purposes, and there was occasional raiding of English settlements in the lower Merrimack beginning during King Phillip's War and reaching a second peak during Queen Anne's War, which began about 1702. In 1704, Governor Joseph Dudley ordered the construction of four defensive blockhouses along the Merrimack. Two were located in Andover, "One at the fording place called Deare's Jump and the other at the fording place commonly called Mr. Petter's wading place." (Fuess 1959:129). These blockhouses were built in six weeks by Andover's military officer, Christopher Osgood, and were said to be 12 feet by 15 feet in dimension (3.7 by 4.6 m). They would have had very little archaeological visibility; however, this appears to have been the first construction by non-Indians at Shattuck Farm.

Indian raiding in this area was essentially ended by 1713, and in 1719 part of the project area was acquired by David Abbot, who bought the land from Samuel Peters, after whom the falls may have been named. (The Peters family was prominent in Andover's history during the late seventeenth century (Fuess 1959).) Abbot built the first farm building on the property, and may well have been the first to farm the fields down by the river.

For the first hundred years of recorded history the project area was a series of small family farms, owned by the Abbot, Noyes, Bailey, and Shattuck families. Disruption of archaeological resources probably occurred primarily through plowing during this period. The farm buildings themselves were built close to River Road, and thus had minimal impact on the areas of primary prehistoric occupation. It is interesting to note that the Merrimack, once a

major transportation route for prehistoric inhabitants of the area, became a transportation barrier during the early historic period, when habitation was oriented toward roads (Steinitz 1981).

A period of major changes for Shattuck Farm, and for the whole lower Merrimack River valley, began in the early 1800s when the region was industrialized. Daniel Saunders, one of the protagonists of the dam at Lawrence, actually considered Peters Falls as a probable location for that dam. In 1840 he bought from Frederick Noyes a 1/3 mile (.5 klm) stretch of land on the south side of the Merrimack which included Peters Falls, and over the next few years he bought other parcels of land on both sides of the river in the vicinity of these falls (Wadsworth 1878:42). Construction of the dam was judged to be simpler at this location than at Bodwell's Falls, but the actual drop was a few feet less at Peters Falls. The Essex Company eventually decided to build their dam at Bodwell's Falls, after all, and thus was born the industrial city of Lawrence. The issue of Shattuck Farm's uniqueness, mentioned in the last chapter, is illuminated by this incident, which indicates how narrowly Shattuck Farm escaped the fate that destroyed comparable or perhaps even larger prehistoric sites that must have existed near Pawtucket and Bodwell's Falls.

The dam at Lawrence, begun in 1845 and finished in 1848, was an engineering marvel for its time (Molloy 1980), but the quality of the engineering did not extend to its fishway, which was a dismal failure. Therefore, 1848 also marks the end of the famous fishery on the Merrimack.

This dam also affected Shattuck Farm directly in several ways. First, it raised the level of the river in this area by some 8 to 10 feet (2.4-3 m), as the Essex Company was allowed to pond water all the way back to the foot of Hunt's Falls. This rise in the river level effectively drowned Peters Falls, and is also likely to have increased erosion of parts of the river bank. However,

construction of dams upstream around the same time period did help tame the river and prevent the enormous floods that had plagued the Merrimack previously (Meader 1869:285; Holden 1958). Also, the presence of these dams necessarily put an end to the practice of floating logs all the way down the river, and this would have halted the erosion previously caused by rafts of logs tearing at the river banks.

Occasional flooding continued on the Merrimack, however, and the last major flood, that of 1936, drowned most of the marsh area. It is reported that Douglas Byers spoke with Ned Shattuck after this flood, and the latter said that he had to put brush and fill into several ravines caused when the soft sediments of the riverbank at Shattuck Farm washed out (Eugene Winter, personal communication).

Although the directors of the Essex Company did not use their land at Shattuck Farm for a dam, they did build a series of summer cottages for their employees there in the late 1880s. It is said that people came by canoe or steamboat from Lawrence and Lowell, and during this period there was a steamboat landing at Laurel Grove (Dorgan 1918:8). Two houses are shown in the area on the 1888 map, but one is labeled Bailey and presumably belonged to the farming families. Seven structures are shown along the river bank on the 1966 topographic map, and although none are standing now, a few foundations and chimneys mark their locations. These cottages impacted prehistoric archaeological sites in at least one area, as will be discussed in Chapter 5.

Thus by 1950 the prehistoric sites at Shattuck Farm had been disturbed by plowing, farming activities, and by construction of cottages. Several dirt farm roads had been made, and the natural drainage had been altered in places to keep the fields from flooding. The mouth of Spindle's Creek had been canalized to allow a road to run all along the river, and the marsh drainage may have been similarly altered, as some maps show a stream running from the

marsh into the river along the west side of the marsh, and this stream is no longer evident. Finally, small-scale sand quarrying had been occurring for some time on the site, in the kame terrace, and the accidental exposure of relics during these operations had encouraged intentional digging for artifacts, as will be discussed below.

Changes to Shattuck Farm accelerated markedly during the latter half of the twentieth century although it was still used primarily for farming. When Interstate 93 was built in the late 1950's parts of the kame terrace were essentially bulldozed away so that the sands could be used as footings for the highway, which also effectively truncated the site to its east. A filtration bed for the nearby Valle's Steak House was built through the east end of the site also around this time. In 1975 Catherine G. Shattuck died and her will directed that the farm be sold and that the proceeds be held in trust. Shattuck Farm was then sold to the Arkwright-Boston Insurance Company, which made plans to develop the property into the Andover Technological Center. The southwest part of the property was sold to the Hewlett-Packard Company, which built a medical equipment plant there in 1975. In the process, large areas were leveled by bulldozing and filling. However, this disturbance did not extend all the way to the river, and areas adjacent to the secondary streams were also left undeveloped.

The east half of Shattuck Farm continued to be leased for farming and grazing until it was acquired by Digital Equipment Corporation, which plans to build a plant there. There has been little disruption of the prehistoric resources as yet, except for those impacted by a large drainage ditch excavated along the west side of Digital property from River Road to the alluvial terrace. The farm buildings have all been demolished or moved in preparation for construction, however.

A 33 meter wide strip of land along the river is held as a conservation

easement by the Town of Andover. This strip has a public dirt path, used currently by pedestrians, horseback riders, motorcyclists, and dirt bikers, but is otherwise unmodified.

The net effect of all these types of land use during the prehistoric and historic periods was complete destruction of about half of the project area (Mahlstedt 1981), disturbance through plowing of most of the rest, and only minor disturbance through mixing in a tiny percentage of the area immediately adjacent to streams, rivers, and wetlands (Figure 3). These various types of disruption also exposed prehistoric artifacts and thus attracted the attention of relic collectors and archaeologists, who began to visit the site at a very early period.

#### ARCHAEOLOGICAL INVESTIGATIONS

Prehistoric artifacts must have been noticed frequently over the 250 years during which the fields of Shattuck Farm have been plowed, and the area has always been very well known to amateur archaeologists. Most of their artifacts were collected from the surface of plowed fields, but some digging also was done at the site, especially in areas that produced burials. The Shattuck family apparently allowed and even encouraged artifact collecting by their neighbors, and were said to be willing to plow fields for people who wished to hunt for relics.

One of the first published references to the prehistoric remains at Shattuck Farm is in a history of Andover dated 1880 (Bailey 1880). Extensive quotations from this and other early sources will be given here, partly because some sources are not easily accessible, and partly because they paint such a vivid picture of the early period archaeology at the site.

"There are remains of an Indian burial-ground at West Andover on the bank of the Merrimack, a mile or more above Lawrence. Skeletons

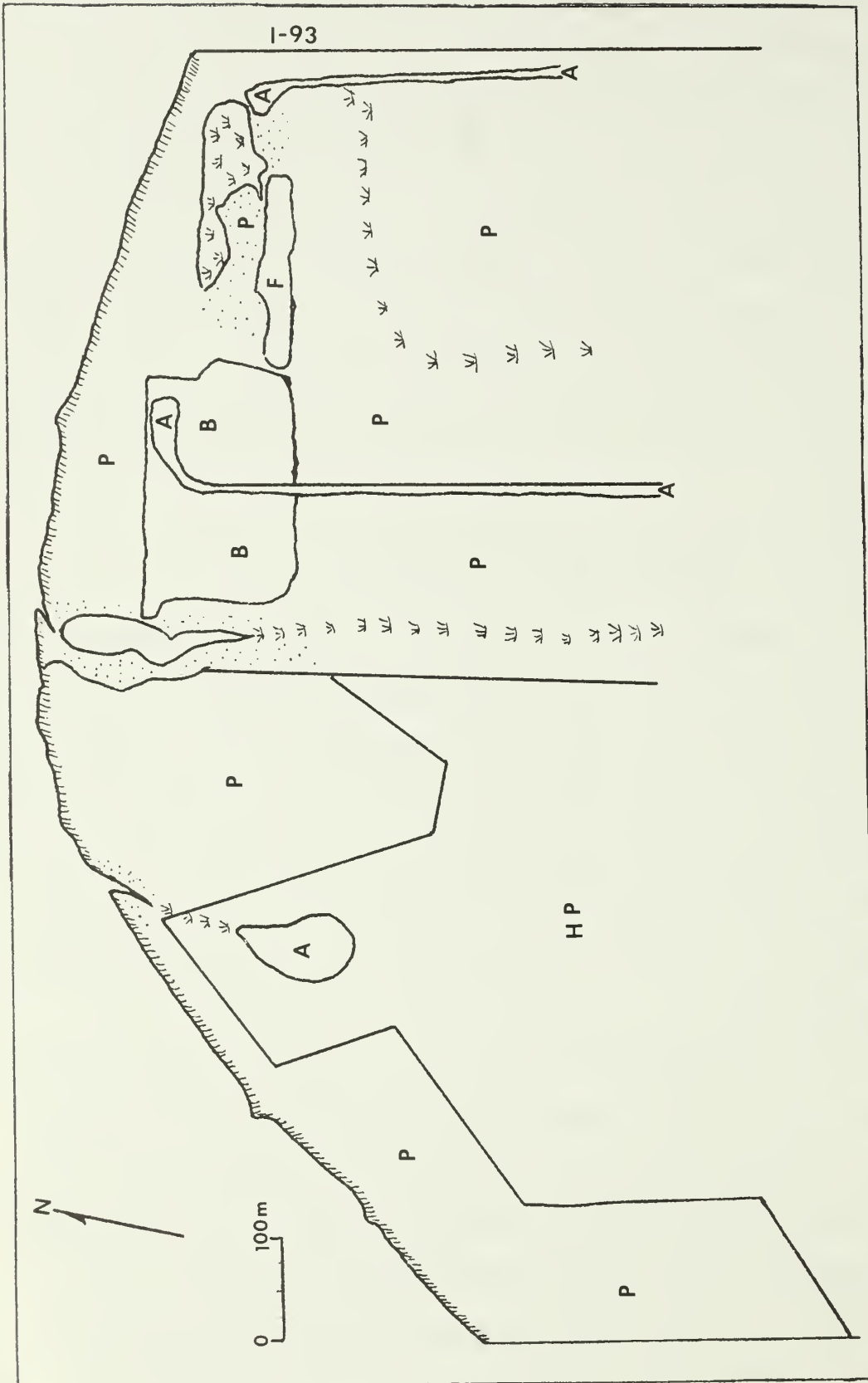


Figure 3. Disturbed Areas at Shattuck Farm. "v" = River erosion; P = Plowed; HP = Hewlett-Packard plant; B = Bulldozed areas; F = Valle's filtration bed; A = Artificial drainage features; w = Natural drainage features; stippled = Relatively undisturbed areas.

of men, women, and children have been exhumed. They were wrapped in hemlock bark. One was of a man of great size and powerful build. He had been buried with especial care, and it is not unlikely, was a sachem or chief." (Bailey 1880:163).

While the exact location of the burial ground is not given, a footnote to this passage says, "The graves were explored by Mr. Francis G. Sanborn, of Andover.", and Moorehead (1931:23) says that Mr. Sanborn dug extensively at Shattuck Farm. Therefore, this passage almost certainly refers to the Shattuck Farm site, perhaps in its larger sense including areas east of Interstate 93.

Another local history writes more specifically:

"Local writers of early history have told us of an Indian village on Pine Island, and within very recent years their places of sepulcher on the Shattuck Farm in West Andover have been desecrated in the hunt for skeletons as well as stone implements which the Indians were accustomed to bury with their dead. [This burial ground]...just below the old steamer landing at Laurel grove, was extensive. Whether a battlefield, a burial place in the days of the pestilence (when ninety percent of the savages died and the Merrimack valley became a vast charnel house), or a usual place of burial, is not known." (Dorgan 1918:8).

In the early 1900s, professional archaeologists associated with the Robert S. Peabody Foundation for Archaeology began to visit the Shattuck Farm site. The following field notes, without author or full date, are in the Peabody Foundation files:

"Digging continued on the Shattuck estate from noon May 18th to Wednesday evening, May 27th. A decayed fragmentary skull was found Wednesday afternoon, May 20th, at the depth of one meter in, about, the center of the sand pit. Broken gouge, broken ornament, several knives, etc. were found at various depths throughout the sand. The sand is very

fine and compact. Beginning at the east and extending into the ridge for 60 or 70 meters, the sand has been hauled away. Inhabitants living down the river, as long ago as 150 years, frequently visited the Indian burial ground, opened graves and carried off their contents. Indications of these excavations are apparent every few yards.

"We carried a 35 foot trench through the ridge for a distance of about twenty-five feet. Small fragments of bones (nearly all burned) were found scattered through the soil at a depth of a half meter to a meter. Monday test pits were sunk on the northwestern end of the sand ridge and Monday afternoon, May 25th, there was found a cremated skeleton. At least, the burned and calcined bones seemed to indicate cremation. These are a hundred or more in number ranging from small scales up to fragments two or three centimeters in length. No objects were placed with the burial, but the following peculiarities were observed. Up to 5 o'clock the evening of May 25th, the indication indicated (sic) that a pit about five meters in diameter had been dug out by the natives and this cremation placed just a meter below the surface on ordinary sand. There was no trace of burning in the pit. Then the excavation was filled with this same ordinary sand and about half a meter above the bones a layer of dark earth containing minute fragments of charcoal, five or six centimeters thick, was placed evenly. Then a layer of sand 11 or 12 centimeters thick above that, then a thin layer of dark earth and fragments of charcoal about 2 centimeters thick. From the top of this upper dark layer to the surface, it was 21 to 23 centimeters. The character of the deposit strikes me as interesting. I do not know of previous discoveries of cremation in New England. It will be necessary to have the bones examined in order to determine whether they are human, but I have not heard of Indians

cremating animals and take it for granted that the bones represent human being."

In the decades between 1900 and 1940, May 20 fell on a Wednesday during six years and only one of these years, 1914, corresponds to a year when other sources indicate that the Foundation was working at Shattuck Farm. Thus, these notes are most likely related to the excavations during which many of the artifacts in the Luce, Gage, and Taylor collections at Buttonwoods were obtained (Appendix I).

Additional information on the Shattuck Farm site is included in the following letter, dated October 14, 1921, and written from A.V. Kidder to Warren K. Moorehead, who was then digging in the Midwest:

"Just a line to let you know I have been doing a little emergency archaeology on your preserves. It happened thusly. A certain Mr. Hayes of Lawrence telephoned yesterday that he had discovered some skeletons on the Shattuck Farm in West Andover and asked me to come over and see them. He was telephoning to you of course but Gladys referred him to me. I went over, got permission from Mrs. Shattuck to investigate and went down to the river bank with Hayes. There had been some bones exposed in an old borrow pit and Hayes had dug them out and messed things up considerably. By going farther in than he had dug I managed to recover a skull in fair shape and a few long-bones, also a nice little celt, a set of antler punches, a bone or antler harpoon head and four or five arrows. The day before Hayes had found three celts, all poor ones and three arrow-heads. These I couldn't get. There were a few sherds of pottery.

This morning a reporter from the Sun American of Lawrence called and I gave him some dope, but asked him not to mention the exact location or this Institution as I thought that any publicity at this

time might hamper you in any future work you might care to do at the locality. The place, a sand knoll, looks very promising and I feel sure there are other burials there. It will make a dandy "old age" job." (Kidder 1921).

Warren K. Moorehead visited Shattuck Farm briefly during his survey of the Merrimack River valley in 1930:

"When at North Billerica, a detail was sent down river to inspect a famous site. Three miles north of Lawrence, on the south side, is the Edward Shattuck farm, where was located one of the largest Indian villages in this part of New England. It was known in Colonial times. Before the textile companies of Lawrence erected the present thirty foot dam, there were falls opposite the Shattuck site, and great quantities of shad and salmon were taken each spring. Mr. Frank Sanborn, residing in Andover from 1875 to about 1895, was much interested in natural history and did considerable digging on the Shattuck site. He found skeletons and numerous stone tools, ornaments, or other objects which were later sold to the Society of Natural History at Worcester, Mass. It is impossible to identify the Shattuck finds in the Worcester museum, although two attempts have been made. In past years the writer went over to the Shattuck site, employed some workmen and dug many pits, finding one or two fragmentary skeletons and two crude gouges. Our party further investigated this site for a day or two in September, as has been mentioned. Mr. Shattuck kindly permitted us to explore, but we were unable to discover graves. Sanborn must have thoroughly ransacked the place. It is most unfortunate that no records, maps, or photographs are available. Shattuck's ancient cemetery has produced a large number of mortuary offerings of superior workmanship. In the Thomas Clegg collection are several

hundred surface finds, mostly small. Many have found their way to museums at Salem and Cambridge. There is a small collection here in Andover, and the Society for the Preservation of New England Antiquities has some. Mr. Luce secured seventy or eighty, and quite a few are in the Samuel Stearns exhibit, Lawrence High School. All told, Mr. Shattuck's land must have produced two or three thousand objects." (Moorehead 1931:23).

Perhaps because of this history of archaeological depredation at Shattuck Farm, Ripley P. Bullen did not test the site during his war-time surveys of the district:

"At what is now Shattuck's Farm, on that river (Merrimack) due north of Haggett's Pond, is a site which was probably the largest site in the region. It has been almost entirely destroyed by floods, sand removal, cultivation, and, according to rumor, by the recovery of Indian relics by oxen and scoops in the eighties." (Bullen 1949:72).

Surface collection continued at the site, however, and one further bit of field work occurred in 1971, when S.K. Thorstensen directed a field school there for students at Phillips Andover Academy. She excavated one 10 foot by 10 foot test pit southwest of the Spindle's Creek pond, just south of our Locus B, and reports that it was sterile. A second 10 by 10 was excavated just inside the northeast corner of the Hewlett-Packard fence in our Locus D, and this square produced a few artifacts and a burned earth feature at a depth of about 1 meter. Unfortunately, the notes or findings from this excavation have been lost (Thorstensen, personal communication).

#### THE SHATTUCK FARM PROJECT OF 1980/1981

There has clearly been no coordinated or thorough study of Shattuck Farm until the current project, which came about in response to rumors that the entire area was going to be destroyed by construction. Wendy Frontiero, then

Andover's preservation planner, became concerned that a legendary site was about to be lost, and contacted the State Archaeologist to see what could be done. The Massachusetts Historical Commission and Valerie Talmage, the State Archaeologist, shared Andover's concern, and began to coordinate a research program at Shattuck Farm which is the subject of the present report. All fieldwork at the site was performed under permit #416 from the Massachusetts Historical Commission.

In beginning this project, we were faced with a very large area, much of which had been disturbed, but all of which was labeled "site" in the state site files. Therefore, a two-stage process of investigation was proposed, in which we would first determine exactly which areas were thoroughly disturbed and which areas still had archaeological potential. In the second stage we would investigate more intensively those areas found to be least disturbed and most productive.

As part of the first stage, background research and an archaeological survey were performed, and both are discussed in the initial publication from this project (Mahlstedt 1981; Steinitz 1981). In addition, we surveyed known collections from the site, in order to obtain as much information as possible from the collectors who had been working at this site for years. Our procedure was to send out letters explaining the project to a long list of amateur archaeologists and others who could possibly have material from the site. We asked them to respond on an enclosed stamped postcard if they had artifacts or information they were willing to share with us. Everyone who responded positively was contacted and their collections inventoried by Victoria Kenyon, who also tracked down the various museum collections from the site. The results of the collector study are detailed in Appendix I, and will be referred to in later chapters.

This collector survey was found to be especially useful for several purposes. First, it helped confirm the results of our field survey, in that the areas in

which the survey found the most artifacts matched the areas where collectors reported finding most of their material. Second, collector information is virtually all we have for some of the destroyed areas of the site, and for the kame terrace in particular. Third, the collections provide a much larger sample of artifacts than our limited excavations could obtain, and this has substantially increased our ability to interpret the time periods represented at the site, as well as some of the activities occurring there.

There are biases to the collection data, of course. Projectile points are certainly over-represented, while flakes, sherds, and hammerstones are surely under-represented. Larger tools are probably proportionally more abundant in collections than are small tools (Baker 1978), and there may be a bias toward quartz tools because they show up against the soils more easily than do felsite tools. Also, there is clearly a bias in the collection areas toward the fields that were normally under cultivation and thus plowed regularly.

Furthermore, the materials inventoried here can only be a small proportion of all the artifacts removed from the fields of Shattuck Farm over the centuries. At least one major known collection was not made accessible to us, and many others have been lost or scattered over the years. However, the sample we do have from the collections is large and therefore likely to be fairly representative of the materials lost. With all the biases and problems of the collections, they still form an invaluable data base for many purposes.

Thus, literature research, interviews with people who lived or did archaeology at the site, collection studies, and systematic surveys of the area all provided valuable basic information on the structure of the site, the areas of disturbance, and the areas likely to be especially productive of prehistoric materials. All of these findings were integrated and used to structure the research plan for the major season of investigation at the site during the summer of 1981. Our approach to these investigations and the procedures used in excavation and analysis will be discussed in the next chapter.

## Chapter 4      PROCEDURES AND TERMINOLOGY

This chapter will describe and discuss the rationale behind the excavation strategy, excavation procedures, and analytical procedures used during the 1981 investigations at Shattuck Farm. It will also define and explain many of the terms to be used in subsequent chapters in discussing the findings and the inferences drawn from them.

### EXCAVATION STRATEGY

Two basic characteristics of this site strongly influenced our excavation strategy; the lack of depth or of obvious stratification, and the discontinuous distribution of prehistoric materials over the site. It should be emphasized again here that the focus of these investigations was on the prehistoric cultural resources. The small amount of historic archaeology done during the 1981 season will be described separately.

Though rumor had suggested that the Shattuck Farm site was deeply stratified, our survey found that this was unfortunately untrue (Luedtke 1983). On the contrary, as with most southern New England sites the majority of artifacts and features were found within 35 cm of the ground surface. Because plowing extended to nearly this depth in many areas, whatever stratification once existed at the site was virtually impossible to detect. Therefore, we decided that we would be more likely to learn about the activities occurring at the site at different time periods by focussing on the horizontal rather than the vertical distribution of the different components. This structured the sampling scheme to some extent by biasing it in favor of the areas which appeared to have few components present.

Our background studies had warned us that large areas of the site had been destroyed, and for the most part these areas were easy to locate and

define on the ground (Mahlstedt 1981). In the remaining areas we found that the Shattuck Farm site was not a single uniform deposit, but rather was made up of a number of more or less discrete areas which produced relatively large quantities of prehistoric materials, separated by areas which produced few or no artifacts. These separate areas are quite different in terms of their sizes, the quantities and kinds of artifacts produced, and the time periods represented, and it would be possible to interpret them each as separate sites. However, it seemed most sensible to retain the term "site" to refer to the entire Shattuck Farm area, which may have originally included tracts to the east and west of the present project boundaries as well. The smaller localities within the Shattuck Farm site will be referred to here as "loci," and will be designated by letters, following Mahlstedt (1981) for the most part. Excavations during the 1981 field season were concentrated within these loci.

It could be argued that the relatively distant spacing of the shovel test pits during the initial field survey might have missed loci at the Shattuck Farm site, and it is undoubtedly true that small areas were missed. However, shorter-interval testing was done in the course of field investigations at locus G, and the results were consistent with the findings of the initial survey. The decision to sample at loci, rather than to sample the entire site area probabilistically was based primarily on limits of time and manpower. Small focussed activity areas and areas of low artifact density can indeed produce interesting information, but they rarely produce diagnostic artifacts. Thus, in the context of a large site known to have been used by humans for 8000 years, the recovery of a small cluster of flakes or other undiagnostic artifacts is virtually meaningless. Therefore, we felt our efforts were best spent on the areas of the site that were most likely to produce datable artifacts.

The strong patterning of the locations where most artifacts were found during the survey suggests that we did not miss any large, important areas.

The areas of most intense use are all located adjacent to secondary water sources, near where they enter the Merrimack, and locations distant from such areas were not productive.

Therefore, excavations during the 1981 season focussed on seven major loci of prehistoric activity located during the initial survey, and concentrated on the sections of those loci that appeared to have the least disturbance, the most features and/or artifacts, and the fewest components. It was desirable to obtain a representative sample of each locus to facilitate comparisons between loci and between this and other sites, and thus a random sample of test pits within each locus was selected.

This required definition of locus boundaries, and this was done primarily on the basis of the survey data, supplemented by topographic considerations. Boundaries are operationally defined as the limits beyond which fewer than 10 prehistoric cultural items of any kind were found in shovel test pits. Some boundaries have since been modified further on the basis of data from the 1981 season, and these changes can be seen on the locus maps. Again, the large survey intervals mean that site boundaries are necessarily imprecise, although the surveyors did additional shorter-interval testing around productive areas to further define their size and extent. The boundaries shown on all maps should be interpreted as tentative, nevertheless. We are reasonably confident that the boundaries shown are accurate, but they must not be interpreted rigidly.

Once locus boundaries had been defined, a hypothetical grid of one meter squares was superimposed on the map of each locus and each square was numbered from one to n. Numbers were then chosen from a random numbers table, with the total number of test pits selected determined for each locus on the basis of its size, the degree of disturbance, the density of artifacts or features, and the total number of test pits we were likely to be able to excavate during the entire season given time and labor constraints. In addition, non-random

squares were excavated at most loci, usually in order to expose features completely. Therefore, the tables of findings for each locus often include both a random sample table and a total sample table, and different uses are made of these two types of samples in subsequent analyses and discussions. The random sample tables should obviously be used to compare between loci and between these areas and any other representatively sampled area. Confidence intervals were not calculated for these data, but should be assumed to be rather large, given the small size of the samples and the amount of observed variability.

### EXCAVATION PROCEDURES

Separate datum points had to be established for most loci because of the distances between the loci. Test pits were then initially laid out by measuring with tape and compass from datum, and exact locations and corner elevations were later shot in with a theodolite. Heavy vegetation and measurement errors resulted in occasional discrepancies between the assigned test pit coordinates and the actual location of the test pit, but differences were usually minor. All locus maps show actual locations of the test pits. Test pit coordinates represent the distance from the northeast corner of the square to datum, in two dimensions. Thus, square N5W2 would be five meters north and two meters west of datum. Most test pits were one meter square, although in a few cases one meter by .5 meter test pits were excavated.

Test pits were excavated in five centimeter levels with three exceptions. First, if any natural change in soil color or texture occurred, a level would be ended there, short of five cm, and a new level would be begun at the top of the change. Second, if the first few test pits in an area indicated that the top levels were nearly sterile, then later pits usually took the top 10 cm as a single layer. Finally, when the density of materials became low near the bottom of a pit, 10 cm levels were used to speed up excavation. In general,

though, five cm levels were used even in obvious plow zone, with the hope that some rough vertical zoning of artifacts might be discernible. This expectation was met in very few of the loci, however. Notes were taken as each level was completed, and after the square was completed all four profiles were drawn and soil colors were noted using Munsell terminology (Munsell 1973).

After the soil had become sterile in each test pit and profiles had been drawn and photographed, a shovel hole was quickly excavated in the floor of the pit to a depth of an additional 50 to 75 cm. This was done so that the project geomorphologist could examine the deeper sediments, and also to make absolutely sure that another cultural level was not buried beneath the sterile zone. No such deeply buried component was ever encountered in these tests.

Trowels were used for excavation, and all soil was screened through 1/4 inch mesh hardware cloth. In addition, if small debitage or bone scraps were noted in a particular square or area, sieves of window screening were added beneath the regular screens to catch the fine fraction. Although some archaeologists now argue that fine mesh screens should be used for entire excavations, we felt that the extra time spent screening would not be cost-effective at this site because it generally did not produce small items that would be of interest. Faunal materials were not abundant, and when found in small fragments they were generally so small and eroded as to be unidentifiable. Floral materials were generally even smaller, and separate soil samples were already being taken for flotation. Where tiny flakes existed, they were usually present in some quantity and were easily spotted so that fine screens could be added to retrieve them. I cannot accept the argument that serious bias has been introduced by these procedures; in fact, the loci with the highest proportions of tiny flakes were the ones where fine screens were not used, indicating that variation in flake size distributions at Shattuck Farm

had to do with prehistoric behavior, not with recovery procedures.

The sherds recovered were already often so small as to give the analyst eye strain, and nothing would have been gained by collecting even more minute fragments. In summary, I cannot prove that we did not lose some artifacts through the screens, but I seriously doubt they would have changed our interpretations of the site. It seems reasonable to assume that small mesh screens should be used primarily at sites which produce numerous small items of sufficient importance to justify the additional time and labor bottlenecks that result from fine screening.

Features were mapped and photographed in plan view when first exposed and then pedestaled while the rest of the square was excavated. They were then quarter- or half-sectioned, as appropriate, and then mapped and photographed in profile. Large soil samples were saved from all features for flotation and fine screening back in the laboratory, and soil samples were also taken from the regular midden soils and from off the site, for control purposes.

Further information about excavation procedures is locus-specific, and will be provided in the appropriate places in Chapter 5.

#### ARTIFACT ANALYSIS AND DESCRIPTION

All artifacts found in the screens or in situ were bagged by level and returned to the laboratory where all were cleaned, sorted into lots by material type, cataloged, and labeled and/or placed in labeled plastic bags. Further analysis, appropriate to each material type, was also performed. Unless otherwise stated, all identifications and analyses were performed by the author.

Charred plant material was sent to Martha Tack, a student of Lawrence Kaplan's of the University of Massachusetts, Boston Biology Department, along with the soil samples for flotation. The soil samples produced virtually no seeds and none that could definitely be considered prehistoric. Charcoal was

identified as to whether it was from dicotyledonous (deciduous) or conifer wood, and in a few cases more specific identifications could also be made. Nutshells were identified by Lawrence Kaplan.

All bone fragments were identified as precisely as possible through comparison with a reference collection, and were also examined carefully for butchering marks or signs of intentional working. Most fragments were very small and eroded, so identification was usually difficult. For this and for other reasons to be discussed in Chapter 6, readers are warned not to interpret the types and proportions of remains given in the locus tables as directly reflective of the subsistence of the people who lived at each locus.

Ceramics require the most discussion here because they were abundant and a variety of terms must be employed for the description of their many attributes. Each sherd, no matter how small, was examined carefully under magnification. For each provenience unit, sherds similar enough to have been from a single vessel were grouped, counted, weighed, and described. Later, these clusters of similar sherds were grouped with similar sherd lots from the other levels of the same square, and then with sherd lots from adjacent or close squares. It was assumed that sherds found greater than 20 m apart were probably not from the same vessel, unless similarity was unusually strong. Through this process, the vessel lots described in the tables in Chapter 5 were obtained. The vessel numbers are almost certainly a minimum rather than a maximum value, because of the tendency to lump the many sherds which had few distinguishing characteristics.

The ceramic table for each locus gives the vessel number, the squares in which sherds of that vessel were found, the depth range, the number of sherds assigned to that vessel, and the total weight of these sherds. Temper is described by type and by an estimate of average size. Fine temper was generally in fragments less than one mm in diameter, medium temper was generally one to three mm

in size, and coarse temper was greater than three mm across. Grit temper was defined on the basis of the presence of angular mineral and rock fragments, while shell temper was recognized by the absence of mineral fragments and the presence of angular, platy holes left from the solution of the shell fragments. In fresh breaks on thick sherds, fragments of remaining shell were sometimes visible.

Vessel paste is described very generally by color; it was judged not reasonable to obtain Munsell colors for each sherd because of the number involved and because color can vary considerably over a single vessel due to uneven firing and to post-depositional factors (Luedtke 1980a). Presence of sand grains or other inclusions was noted in some pastes. Since these inclusions always occurred along with grit or shell temper and sometimes varied in density between sherds from the same vessel, they were considered accidental inclusions rather than temper. They could have been present in the original clay, or may have been incorporated from the substrate upon which the vessel was manufactured.

Vessel thickness was measured on sherds with both interior and exterior surfaces present, and is often given as a range in the vessel descriptions because of variation between sherds. In some cases the range is very wide, which may mean that sherds from more than one vessel have been combined. In other cases, though, sherds are undoubtedly from the same vessel and variations in thickness simply reflect unevenness in the vessel. Specifically, there is nearly always a difference in thickness between rim and body sherds. For vessels represented by sherds with only one surface present, thickness is given as ">n", with n equal to maximum sherd thickness.

Vessel interior surfaces are usually described in the literature by a wide variety of terms such as wiped, scraped, stick wiped, etc. I do not feel comfortable making such distinctions without having personally performed

experiments to see exactly which procedures produce which results. I also suspect that different parts of the interior of the same vessel might show marked differences in finish, due to differences in interior surface accessibility. Therefore, the only distinction made here is between smoothed and cordmarked interior surfaces.

Exterior surfaces show the widest variety of decorative elements, and the terms used here should be considered primarily descriptive, without definite implications as to the way the marks were actually made. Many elements could be made in more than one way, as will be discussed here and in Chapter 6.

"Cordmarked" is used to indicate a pattern of many parallel linear impressions (Figure 4). Some cordmarking may have been made by pressing fabrics against the vessel, but most are probably marks left by paddles densely wrapped with twisted cords. In most cases in this sample there were two or three cords per cm, but in a few cases the cords are smaller and denser, with five or more cords per cm. This pattern was called "fine cordmarked." In "Smoothed cordmarking," the impressions are partially to nearly totally obliterated, either intentionally or unintentionally. "Cord impressed" indicates a mark apparently left by a single cord pressed into the wet clay. On very small sherds, such marks are difficult to distinguish from those left by cordmarking, cordwrapped sticks, or net impression. "Cordwrapped stick impression" indicates a design element in which a number of short linear impressions are perpendicular to and centered upon a depressed trough (Figure 4). These marks may have been left by the lateral edge of a cordwrapped paddle, or by cord wrapped loosely around a stick, reed, or even a string (McPherron 1968). These impressions can be easily confused with dentate stamping on small sherds.

"Dentate stamping" leaves shallow impressions or depressions of square, rectangular, or oval shape, each clearly separated from the others. In "Linear stamping" the impressions are connected and usually appear as a row

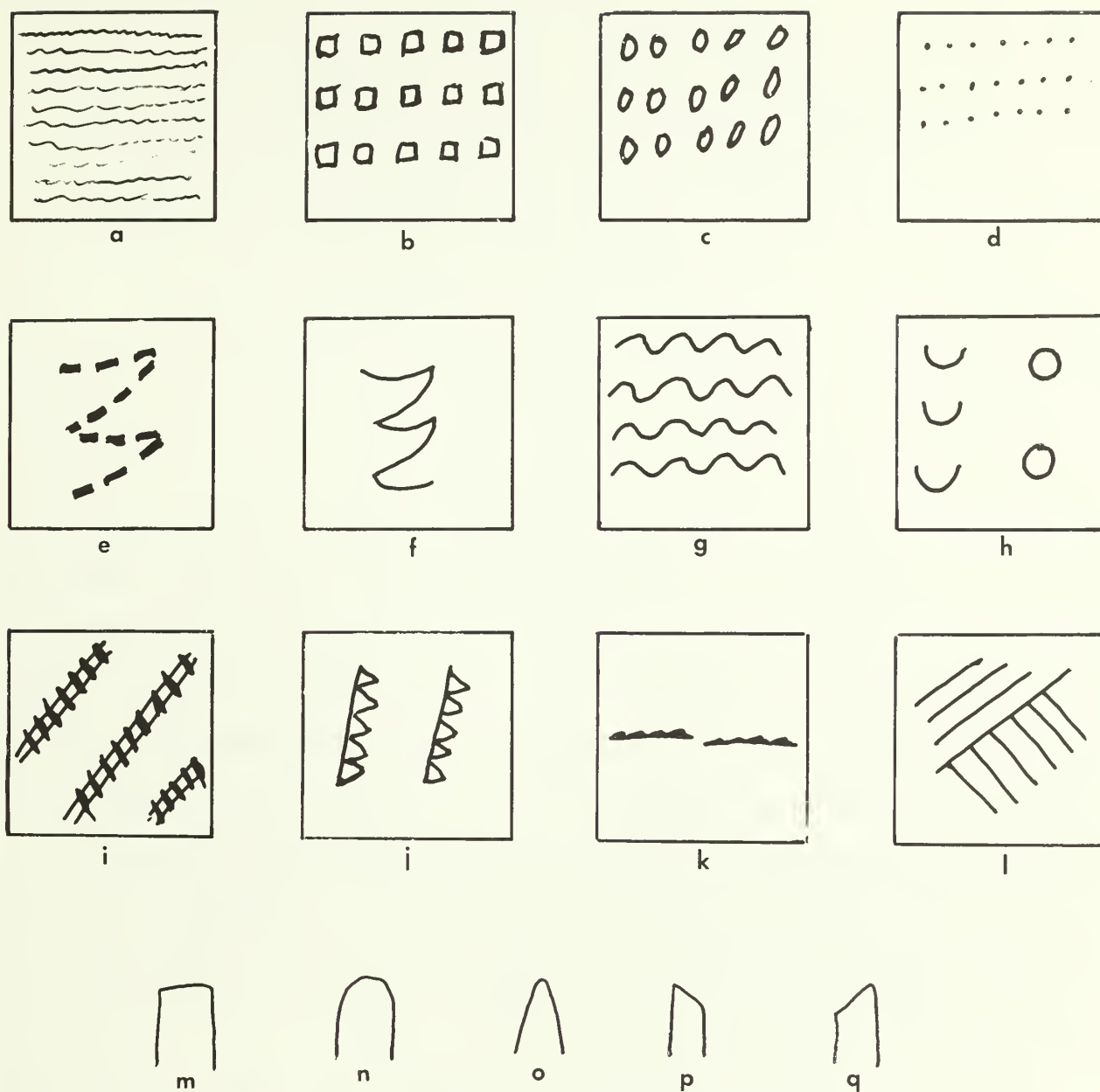


Figure 4. Ceramic Decoration and Rim Shape Terminology. Decoration: a = Cord-marked; b and c = Dentate stamped; d = Comb impressed; e and f = Rocker stamped; g = Scallop impressed; h = Reed impressed; i = Cord-wrapped stick impressed; j and k = Linear stamped; l = Incised. Rim shapes (interior to left): m = Flat; n = Rounded; o = Pointed; p = Tipped out; q = Tipped in.

of triangular depressions if the tool was impressed at an angle to the vessel surface, or as a slightly wavy line if the tool was impressed directly perpendicular to the surface. "Rocker stamping" resulted when a tool with either a smooth or dentate edge was rocked back and forth across the vessel, resulting in a zig zag line of impressions. "Comb impressed" is used here to describe a pattern of a line of deep, round to oval impressions, usually pointed at the base and apparently too small and close together to be punctations. "Punctations" are larger and generally further apart, but were also made by a round pointed object poked into the soft clay. "Scallop impressed" design appears as a pattern of wavy lines that resemble the edge of a scallop shell in size and shape. "Reed impressed" is used here to indicate shallow, round or half-moon impressions in which the center is not depressed, suggesting that a hollow tube was used to make the impression.

"Incised" sherds bear straight lines varying in depth from shallow to deep, and in cross-section from flat to V-shaped. Incised lines usually occur in patterns, with groups of lines parallel to or at an angle to each other. Incising could have been performed by a wide variety of tools including the edge of a paddle, a sharp flake, or virtually anything with a sharp corner. Sometimes the regularity of the spacing suggests that a dentate tool was dragged across the surface of the vessel.

"Nodes" were formed by the addition of a small lump of clay molded smoothly to the surface of the vessel. "Burnishing" results in a surface that is compacted and a little shiny, and is assumed to result from rubbing the vessel surface with a stone or other hard object when it was partially dry.

Rim sherds were relatively abundant in the Shattuck Farm assemblage, and the descriptive terms used to indicate their shapes are illustrated in Figure 4. There is not always a clear distinction between these shapes; in some cases where a number of rim sherds from the same vessel were found, the rim varied in

shape from nearly round to nearly flat. Such variation is certainly to be expected in hand-made vessels where uniformity and quality control were not important considerations.

Most other vessel attributes were difficult to tell from sherds the size of most of those recovered at Shattuck Farm. Where such attributes were determinable, they are described in the column headed "other" in the ceramic tables in Chapter 5. For example, where enough of the vessel was found it was sometimes possible to tell that the vessel had been necked, collared, or castellated. However, this may also have been true of some of the other vessels represented by sherds too small to determine vessel shape. Also, in a few cases sherds large enough to be placed on a diameter chart were found, thus allowing estimation of mouth or body diameter of the vessel. In no cases could basal shape be definitely determined. Finally, some of the sherds showed coil breaks, the characteristic concave or convex fracture surfaces perpendicular to the outer surface and parallel to the rim, which are indicative of the mode of vessel formation.

Worked stone artifacts were measured and examined under a microscope for use wear. Raw material type and color were noted. Basic descriptions and measurements for each artifact are given in the tables accompanying the locus descriptions, and more detail is provided for many tools in the text of the description. It should be noted that all measurements refer to the maximum for that dimension. Each worked stone artifact was numbered consecutively by locus so that it could be followed through the various tables and figures. This number does not correspond to the catalog or accession number, however, which is given in the tables for lithic artifacts at each locus. Readers should see Chapter 6 for a discussion of the probable functions of the stone artifacts described in Chapter 5.

Flakes were divided into material types and then separated into four

rough size categories. "Tiny" flakes were those less than .5cm in maximum dimension, "small" flakes were one to two cm in diameter, medium flakes were two to three cm in diameter, and large flakes were greater than three cm in diameter. Flakes were further subdivided on the basis of presence or absence of cortex, and then counted and weighed. Some larger flakes were examined for use wear under a microscope, but the large number of flakes precluded systematic examination, unfortunately. Flake numbers and weights are shown by depth on the locus summary sheets in Chapter 5, and raw material types are shown on separate tables for each locus.

Fire cracked rock (FCR) is used to designate angular fragments of stone with reddened or darkened surfaces and irregular and cracked fracture faces. These rocks may have been "fire rock," used in and around fires, or "pot boilers," rocks which were heated in fires and placed into containers of food to heat their contents. Fragments of fire cracked rock were grouped by raw material type and then counted and weighed for each provenience unit. Again, numbers and weights are shown on the summary sheets, while raw material types are found on a separate table.

Historic artifacts are grouped on the summary sheets and described briefly by types in the text for each locus. Most historic artifacts were identified by John Tuma, a Masters candidate in the Historical Archaeology graduate program at the University of Massachusetts, Boston.

Features are described in detail in the text of the locus descriptions, and their functions will be discussed further in Chapter 6. They are also indicated by vertical bars representing their depths on the summary tables, so that their distributions can be compared with the depth distributions of the other materials.

After washing, cataloging, and analysis, all artifacts were placed in labeled plastic bags. Their permanent repository will be the R.S. Peabody Foundation for Archaeology in Andover, Massachusetts.

## Chapter 5 RESULTS OF ARCHAEOLOGICAL INVESTIGATIONS

In this chapter each of the tested loci will be described in detail. The ecological and topographic situation will be described for each, along with the sampling procedure used, the soils, and the artifacts and features found. Maps show contours of the loci and locations of squares and of shovel test pits from the 1980 survey. Further information on the soils at each locus can be found in Appendix II. Comparisons between loci will then be drawn, stressing differences but also mentioning some of the similarities. The chapter will end with a discussion of the sections of the Shattuck Farm site that were not tested during the 1981 season, in order to summarize what is known about these areas from other sources.

Most of the material in this chapter will be descriptive; however, at the end of each locus description will be brief interpretations of time periods and activities at this locus. Some of these interpretations are based on inferences discussed in Chapter 6, and the reader thus must wait for the arguments justifying these interpretations. However, it was felt to be preferable to keep locus-specific information all in one place, rather than to divide the descriptive and interpretive comments into separate sections.

### LOCUS A

Locus A is a 1000 square meter area located on the southeast bank of a small stream that flows into the Merrimack near the west end of Shattuck Farm (Figures 5 and 6). The edge of the locus is just seven meters from the Merrimack and 14 meters from the stream, with a steep bank dropping down to both watercourses. Datum A is at an elevation of 17 meters above mean sea level; it should be noted that the contours shown on Figure 6 do not reach to the edge of the river. The locus is on a narrow level terrace and is now covered by open pine forest, without



Figure 5. Locus A, Site View from West.

significant undergrowth other than poison ivy.

This locus was discovered during the 1980 survey and was called the "Confluence of the Unnamed Stream site" in the report of that survey (Mahlstedt 1981). No collectors reported finding materials, although several did remember finding artifacts "west of Spindles Creek." The survey located numerous flakes and a few sherds here, and it appeared from those limited tests that stratification might be present.

A random sample of nine one meter squares was excavated, and two more nonrandom squares were also excavated to expose all of feature 3. The materials recovered are listed in Tables 3 through 9.

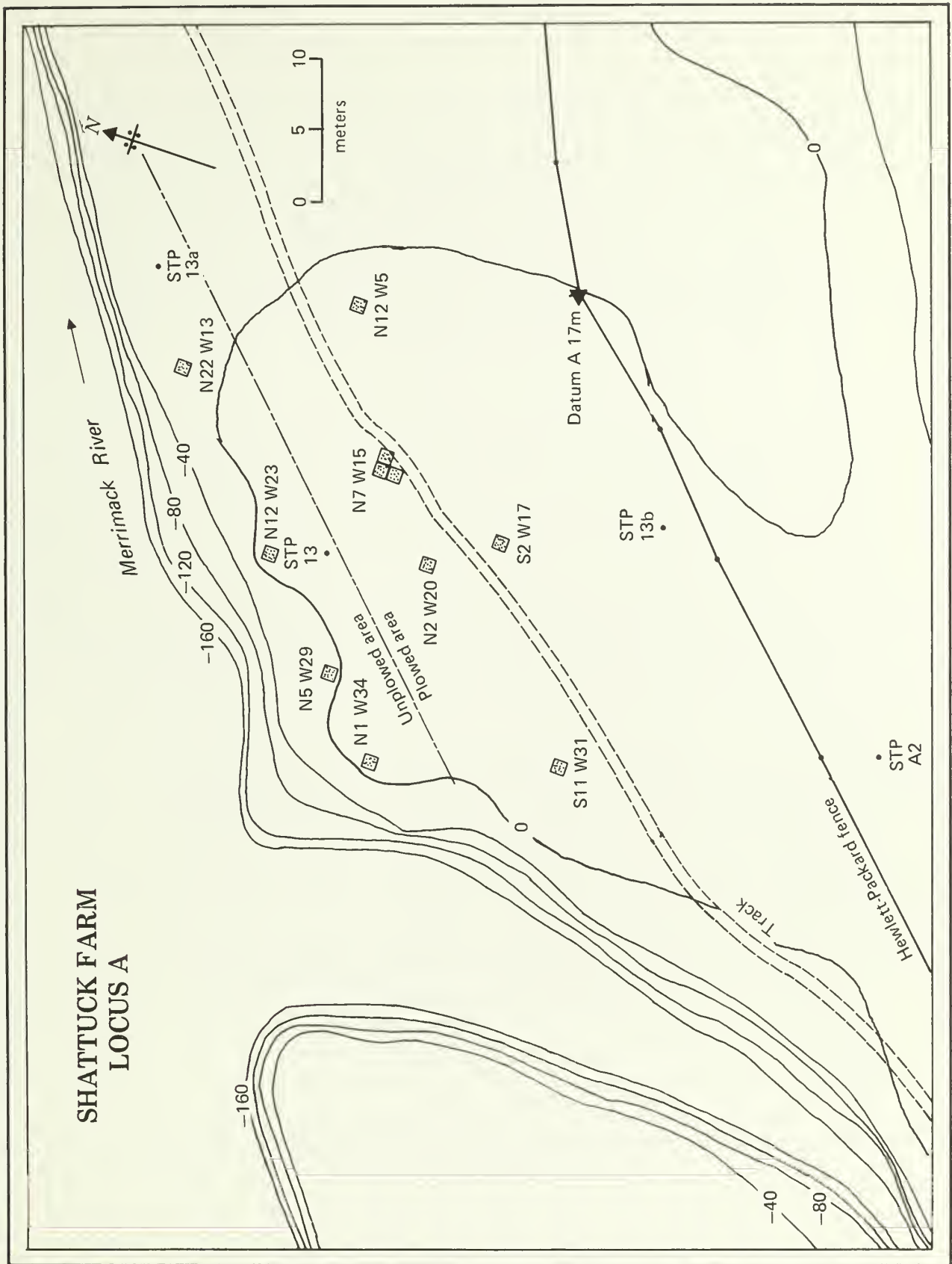


Figure 6. Map of Locus A.

Table 3. Locus A Excavated Materials: Total Sample (N=11m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0							
5	5 54.3			2 11.9	1 9	287 2436.0	
10			#3	16 19.8	17 821	449 1582.4	F5
15	12 .8	7 7.0	#4	62 54.3	42 986	287 769.6	F1
20	6 1.1	5 3.3	#5, 14	84 75.8	58 2180	172 432.1	
25	11 2.4	6 3.5	#2, 7, 9, 10, 11, 12	195 263.9	189 25320	230 455.3	F3
30	8 1.0	3 3.1	#6, 15	110 89.1	369 26401	78 726.9	F4
35			#1	18 49.6	48 1809	55 254.7	
40	1 .2			40 29.0	46 2312	1 1.1	
45				17 2.6	18 378		
50			#8	9 11.3	14 790		F2
60			#13	5 1.4	6 276		
70				2 .6	1 18		
T	43 59.6	21 16.9	15	560 608.3	809 61300	1560 6658.1	

Table 4. Locus A Excavated Materials: Random Sample (N=9m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0							
5	5 54.3			2 11.9	1 9	287 2436.0	
10			#3	11 5.2	15 780	225 1482.8	F5
15	7 .4	6 6.6	#4	46 29.0	33 790	128 377.6	F1
20	6 1.1	4 2.8	#5, 14	47 54.6	49 1935	165 420.6	
25	11 2.4	6 3.5	#2, 7, 9	111 178.0	67 3868	231 455.3	F3
30	8 1.0	3 3.1	#6, 15	103 78.4	256 19215	78 726.9	F4
35			#1	17 49.4	45 1764	55 254.7	
40	1 .2			38 26.1	46 2312	1 1.1	
45				16 2.4	18 378		
50			#8	9 11.3	14 790		F2
60			#13	5 1.4	6 276		
70				2 .6	1 18		
T	38 59.4	19 16.0	12	408 448.2	551 32115	1170 6155.0	

Table 5. Locus A Ceramics (Total Sample)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#1	S11W31 N5W29 N2W20 10-30 cm	4	4.4	shell	light brown	.52-.6	smooth	smoothed cordmarking	—	—
2	S2W17 20-30 cm	2	1.7	fine grit	grey- black	.34	smooth	smoothed cordmarking	—	—
3	N2W13 20-25 cm	2	.6	fine grit	light brown	.2-.33	smooth	smooth	pointed	mouth 3 cm in diameter miniature? pipe bowl?
4	N1W34 S2W17 10-20 cm	2	1.1	fine grit	grey- black	.5	smooth	diagonal cordwrapped stick impressions	flat, tapered toward inside	mouth 17 cm in diameter
5	N7W15 N5W29 N12W23 15-30 cm	7	6.9	medium grit	yellowish brown, sandy	.53->.8	smooth	smoothed cordmarking with horizontal linear stamping	rounded	—
6	N6W15 0-20 cm	2	1.3	fine grit	black	>.52	—	horizontal linear stamping	flat	—
7	N12W5 N22W13 10-25 cm	2	1.3	fine grit	light brown	>.45	smooth	smoothed cordmarking	—	—

Table 6. Locus A Lithic Artifacts (Total Sample)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
1 (207/1469)	N2W20	Saugus rhyolite	4.3	1.9	1.2	10.1	biface (Figure 30b)
2 (207/1937)	N12W23	grey- green felsite	2.9	1.8	.5	2.7	triangular projectile point (Figure 30a)
3 (207/1341)	N7W15	white quartz	3.0	2.3	1.2	9.6	broken end scraper (Figure 29a)
4 (207/2158)	N22W13	Merrimack quartzite	8.6	3.3	1.5	63.6	utilized flake-knife
5 (207/1423)	S11W31	white quartz	2.2	1.8	.8	3.2	rectangular thumbnail scraper (Figure 29b)
6 (207/1519)	N5W29	grey felsite	1.3	1.1	.2	1.2	utilized flake-scraper
7 (207/1479)	N2W20	grey quartz	2.1	1.1	.7	1.6	broken edge from scraper
8 (207/1335)	N1W34	yellow quartz	5.0	4.1	2.0	46.2	hammerstone
9 (207/1478)	N2W20	white quartz	2.4	1.9	.8	3.6	thumbnail scraper (Figure 29c)
10 (207/1692)	N7W14	Merrimack quartzite	16.4	10.5	7.4	1660.0	hammerstone, pounder
11 (207/1689)	N7W14	grey quartz	7.7	6.4	4.0	284.6	core
12 (207/2164)	N22W13	grey quartz	3.4	3.3	2.2	32.0	core
13 (207/1631)	N12W5	light grey quartz	4.3	3.2	1.8	28.3	core
14 (207/2353)	N6W15	grey quartz	2.9	2.3	2.1	15.8	core
15 (207/2170)	N22W13	grey quartz	5.1	3.3	1.9	23.6	core

Table 7. Locus A Flake Numbers and Weights (Total Sample)

Depth	Quartz		Grey felsite		Grey rhyolite		Quartzite		Argillite		Black chert		Total	
	#	gms	#	gms	#	gms	#	gms	#	gms	#	gms	#	gm
0	2	11.9											2	11.
5	13	18.0	3	.8									16	18.
10	45	46.6	7	3.0	9	7.4	1	.2					62	54.
15	75	67.3	3	3.8	6	4.7							84	75.
20	157	244.3	21	10.9	11	5.6	6	2.2	1	.8			195	263.
25	102	83.1	3	.4	1	.1	3	1.3			1	.1	110	89.
30	9	48.3	9	1.3									18	49.
35	18	26.2	22	2.8									40	29.
40	7	1.2	9	1.4			1	.1					17	2.6
45	2	10.1	7	1.2									9	11.3
50			4	1.3	1	.1							5	1.4
60			1	.2	1	.4							2	.6
70														
T	430	557.1	89	27.0	29	18.2	11	3.8	1	.8	1	.1	561	608.2

Table 8. Locus A Flake Percentages (Total Sample)

Depth	Quartz		Grey felsite		Grey rhyolite		Quartzite		Argillite		Black chert	
	#	gms	#	gms	#	gms	#	gms	#	gms	#	gms
0	100%											
5												
10	81.2	95.5	18.8	4.5								
15	72.6	85.9	11.3	5.5	14.5	13.6	1.6	.4				
20	89.3	88.7	3.6	5.0	7.1	6.2						
25	80.5	92.6	10.8	4.1	5.6	2.1	3.1	.8	.5	.3		
30	92.7	93.3	2.7	.5	.9	.1	2.7	1.4			.9	.1
35	50.0	97.4	50.0	2.6								
40	45.0	90.5	55.0	9.5								
45	41.2	45.3	52.9	57.4			5.9	3.8				
50	22.2	89.4	77.8	10.6								
60			80.0	92.8	20.0	7.1						
70			50.0	33.3	50.0	66.7						
T	76.6	91.6	15.9	4.4	5.2	3.0	2.0	.6	.2	.1	.2	.02

Table 9. Locus A Fire Cracked Rock (Total Sample)

FCR	Merrimack Quartzite	Granite	Slate	Quartz	Other Quartzite	Diorite	Felsite	Total
Number	711.0	54.0	26.0	20.0	2.0	2.0	1.0	816.0
% by Number	87.1	6.6	3.2	2.4	.2	.2	.1	99.8
Weight in Grams	43234.0	8230.0	2448.0	1374.0	15.0	6075.0	13.0	61389.0
% by Weight	70.4	13.4	4.0	2.3	.02	9.9	.02	100.0

The soils at this locus are of Windsor types, and the locus has a mixed history of land use. Squares to the south of the dotted line shown on Figure 6 all have plow scars running from north to south, and a soil profile that includes 0-25 cm of medium brown (10YR 4/4) sandy soil, 25-50 cm of orange (10YR 5/8) sandy soil, and pale yellow (10YR 6/6) sandy soil below 50 cm. A thin ashy horizon was beginning to form just under the topsoil in some squares and this fact, plus the size of the trees on the locus, suggests that the area was plowed early in the farm's history but later allowed to revert to woodland.

To the north of the dotted line there are no plow scars and the soil profile shows 0-10 cm of ashy grey (10YR 6/2) sandy soil beneath the leaf litter, 10-30 cm of medium brown (10YR 3/4) sandy soil below that, 30-50 cm of orange (10YR 5/8) sandy soil, and pale yellow (10YR 7/4) sandy soil below 50 cm. Most of the squares in this unplowed zone do have considerable historic disturbance in their upper levels, however, due to the proximity of Essex Company summer cottages. Both parts of this locus showed some evidence of

rodent disturbance.

Prehistoric bone from this locus included four fragments of turtle shell (.8 gm), three bird bone fragments (.5 gm) and 31 fragments of unidentifiable bone (4.2 gm). Most bone was associated with the various features. There were also two cow ribs, a pig(?) rib, and two other large mammal bones from a historic dump feature (54.3 gm). One hickory nutshell was found in N12W5, and flotation produced quantities of hardwood and conifer charcoal, plus charred fragments of pine cones. No seeds were found during flotation of the feature contents.

Ceramics at this locus are fragmentary, evenly scattered among the test squares, and not very abundant, but all appear to be Late Woodland in age and most probably date to the later part of this period. The dentate stamped sherd mentioned in the survey report appears on reexamination to be cordwrapped stick impressed, and is probably part of vessel 4.

Lithic artifacts include two bifaces, six scrapers, two hammerstones, a utilized flake, and five cores. Artifact 1 is a thick somewhat crude biface that was probably used as a knife (Figure 30b). Microscopic examination of the edges revealed a 2.3 cm long area of chipping and crushing along an edge opposite a blunted edge. This tool may have been used in the hand, but its very small size suggests rather that it was hafted. The second biface, artifact 2, is a thin, carefully chipped triangular projectile point with an uneven, convex base (Figure 30a). It is within the size range for Madison points (Ritchie 1971), but the lack of use wear and shape of the base suggest that the point was never finished.

Artifact 4 is unusual as it is the only tool we found, other than hammerstones, made on Merrimack Quartzite. The tool is a rectangular rock fragment, triangular in cross section, with one edge blunted and the other showing chipping and rounding wear. This appears to be a natural fragment

of the quartzite which was modified for cutting or perhaps scraping tasks.

Artifacts 3 and 9 (Figure 29a, c) appear to be bifacial scrapers, both made of quartz and both broken. The former has a curved working edge of about 2.5 cm in length, while the working edge of the latter is 2.3 cm long and straight. Artifact 3 shows little wear, while artifact 9 is heavily worn, especially at the corners. Artifact 5 is a flat rectangular end scraper with a working edge of 1.9 cm (Figure 29b). Artifact 6 is a utilized flake with fine scraper wear over an edge 1.3 cm long. Artifact 7 is the broken edge of a scraper which shows considerable wear. Most of these scrapers are made of quartz, so the wear is very difficult to interpret, but the even, rounded edges may indicate use on hides.

Artifact 8 is a pebble with one large flake removed from it. The resulting sharp edge has been battered along its full length, apparently in the course of use of the tool as a hammerstone. Artifact 10 is a tabular pounding stone. Artifacts 11 through 15 are all cores with no signs of wear or use.

The debitage from this locus presents a complex problem because it almost certainly relates to more than one occupation. It consists of predominately quartz flakes, with grey felsite next most abundant and a variety of other materials present in small quantities. There is some variation in the density of debitage, with the highest concentrations around the rock platform, feature 3. The size distributions are different for the different materials. For quartz, 6% of the flakes are big, 14% are medium, 48% are small, and 33% are tiny, with 6% of the flakes showing cortex remnants. Felsite flakes are 7% medium sized, 38% small, and 55% tiny, with 7% having cortex. The rhyolite, quartzite, and argillite flakes show a distribution of 17% medium, 70% small, and 19% tiny flakes, with 17% of the flakes showing cortex.

Fire cracked rock at this locus is predominately Merrimack quartzite, as it is at all loci. Fire cracked rock is not abundant in the southern squares, and most of it was found in the rock platform. There are also slightly elevated numbers of fire cracked rock in the squares with features 4 and 5.

Historic materials were more abundant at this locus than at any of the others tested, apparently because of the presence of a demolished summer cottage nearby. This cottage, apparently of frame construction with a brick chimney, produced the large quantities of brick fragments and the square nails, screws, rivets, window glass, plaster fragments, door latch and hinge, asphalt shingles, and linoleum fragments found at the locus. Other artifacts are domestic and were probably used by the inhabitants of the cottage. They include fragments of glazed ceramics, bottle glass, clay pipe fragments, coal, tin can fragments, a spoon, and a paint can. As would be expected at a summer cottage, the rest of the artifacts can be considered more or less recreational. They include a complete 78 RPM long playing record, a clay marble, a toy wheel, a harmonica, a toy plastic "kool aid" container, tobacco tins, bottle caps, a bullet, and a shotgun shell cartridge. The latter artifacts may relate to more recent uses of Shattuck Farm for hunting and target practice.

A few of the nails and ceramics could date to the early 1800's, but no artifacts were definitely older than this period (John Tuma, personal communication). Virtually all the historic remains date to the late 19th and early 20th centuries, and are associated with the Essex Company summer cottages which were built along the banks of the Merrimack in the late 1800's for the use of employees of the company. They were apparently taken down at various times in the 20th century; some are still shown on the 1966 topographic map of this area.

Five features were found at the locus, one of which was historic. This was feature 1, located in square N5W29, which was a portion of a burned trash dump. Although it was undoubtedly quite extensive, the portion of it uncovered in this square was 90 cm long, covering the entire west side of the square and extending 35 cm into the square. It extended from 15 to 40 cm below the ground surface, and the soil in it was black, very greasy, and full of historic artifacts.

Feature 2 was also in N5W29, but lay considerably deeper. It appeared as an oval patch of dark black charcoal, 35 cm long and 15 cm wide, extending from 50 to 65 cm below the ground surface (Figure 7). It was oval in cross-section, also, and was filled with little burned twigs identified as primarily pine with a few hardwood twigs (Tonya Largy, personal communication). No seeds or nuts were obtained from the feature and no cultural materials of any kind were associated with it. In fact, this feature was 20 cm deeper than any of the other artifacts in the square. However, there were no indications that this was a burned burrow, and other squares at this site did produce debitage at comparable depths. This feature produced a radiocarbon date of  $4290 \pm 145$  radiocarbon years BP (GX-9000), and this would appear to date a Late Archaic occupation at the locus at about 2340 B.C.

Feature 3 was discovered in N7W15, and 2 additional squares were excavated in order to expose most of it. This feature is a rock platform (Figure 8), beginning at 25 cm and extending to 35 cm below ground surface. It was made of one course of rocks, all densely packed and showing signs of intense burning. The shape was relatively round, and 1.5 meters in diameter. Charcoal was associated and was primarily conifer, with some birch and other hardwoods also represented. A few scraps of unidentifiable bone, a hammerstone, and much quartz debitage were also closely associated with this feature.

Feature 4 was around area of reddened soil located in square N12W5.



Figure 7. Locus A, Feature 2. Charcoal pit, cross-sectioned in south wall of N5W29.



Figure 8. Locus A, Feature 3. Fire cracked rock platform in N6W15.

It was 30 cm in diameter, basin shaped in cross-section, and extended from 35 to 45 cm in depth. A few fragments of fire cracked rock, dicot charcoal, and charred nut shells were associated, along with charred pine cone fragments and a charred juniper berry. A number of felsite flakes were also associated with this feature.

Feature 5, located in N22W13 was a more or less round lens of dark ashy hard packed soil overlying a pit of darker soil. The entire feature was about 30 cm in diameter; the ash lens extended from 10 to 15 cm below ground surface and the dark pit basin-shaped pit extended from 15 to 25 cm. This feature was associated with conifer and dicot charcoal, fire cracked rocks, ceramic vessel 7, artifact 4 (a quartz core), and a number of flakes, most of which were quartz.

Artifacts were found to considerable depths at this locus, suggesting more than one occupation. Artifact styles and the radiocarbon date confirm later Late Woodland and Late Archaic occupations, but use of the area at other times cannot be ruled out. Squares were divided into ceramic and preceramic components in an attempt to see whether differences in the distribution of flake sizes and in lithic raw materials would be found, but this was not successful. Material types and size distributions were nearly identical for the ceramic and preceramic levels, though there were marked differences between squares. Furthermore, if an unusual material appeared in a square, it would be found in all levels from the top to the bottom of the square. There would seem to be two possible explanations for this distribution. First, that most of the debitage at the locus relates to the Late Archaic occupation, and was brought upward by plowing and historic activities to mix with the later materials. Second, that most of the debitage relates to the Late Woodland occupation, but that some of the flakes were dragged downward by normal soil processes. A third possibility, that

lithic material use and procurement stayed constant over 3500 years, is not considered likely.

Other materials at the site did sort out by time period. Nearly all the bone was associated with the ceramic levels, and feature 5 is also shallow and clearly associated with the ceramic occupation of the locus. On the other hand, feature 2 produced a Late Archaic date and feature 4 is at a comparable depth, 15 cm below the nearest ceramics. The only ambiguous feature is feature 3, the rock platform, which begins only five cm below the nearest ceramics. However, it is closely associated with quantities of an unusual vitreous grey quartz, which is abundant above the feature but not below it. This feature will simply have to be assigned on the basis of radiocarbon dates which will be run later.

The dated features may shed some light on the debitage problem; feature 5, the Late Woodland fire area, is associated primarily with quartz flakes, while feature 4, of probable Late Archaic age, is associated primarily with grey felsite flakes. However, the variation in flake materials between squares makes me unwilling to draw the conclusion that these materials were typical of their respective periods at this locus.

Among the lithic artifacts, the triangular projectile point, the knife, all the scrapers, and one core are all associated with ceramics in the upper levels. Artifacts from the lower levels include only the Saugus rhyolite biface, a hammerstone, and two cores. Two more cores and the pounding stone were associated with the rock platform, so are not attributable at this time.

On the basis of the evidence discussed above, it is possible to suggest a rather light Late Archaic occupation of the area, although the roster of artifacts and other remains is too slim to say anything about the seasonality or activities. A late Late Woodland occupation produced more evidence; the presence of bird bone and of many scrapers which may have been used on furs

suggests a small fall occupation. The area was not heavily used during either period, and the pattern of variation in lithic raw materials between squares suggests that occupations may have been small and repeated.

#### LOCUS B

Locus B is a 750 square meter area on top of a knoll (Figures 9 and 10). Its boundaries are about 85 meters south of the Merrimack River and 35 meters west of Spindle's Creek. Datum B is at an elevation of 19.5 meters above mean sea level. The knoll is relatively level to the west, but slopes markedly to the north and south and drops off very steeply to the east. The area is



Figure 9. Locus B, Site View from North.

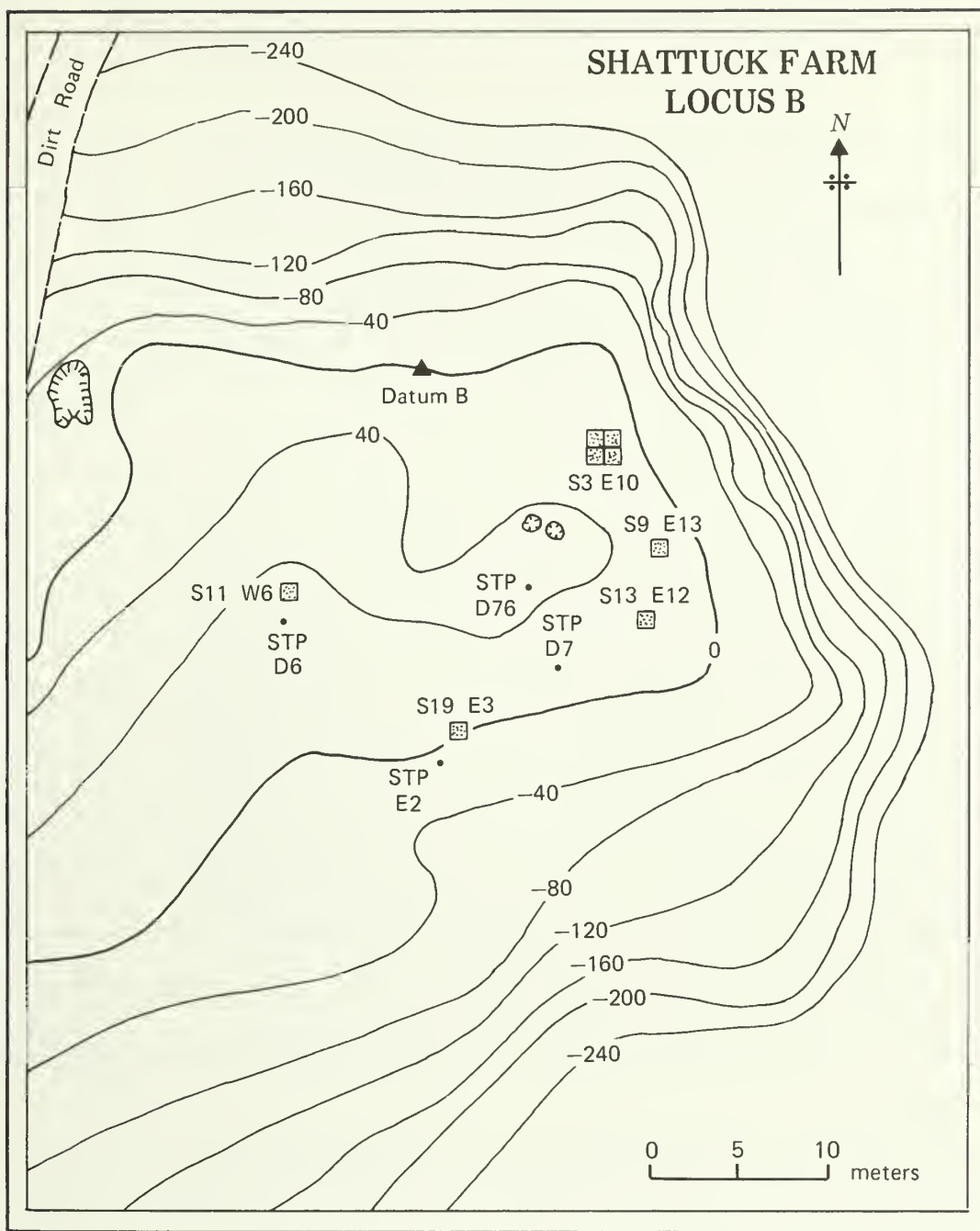


Figure 10. Map of Locus B.

now covered by open forest composed of hemlock, pine, and a few oak trees, with very little undergrowth except to the west and south sides of the knoll.

This locus was discovered during survey, when flakes and charcoal were found in shovel test pits (Mahlstedt 1981). This area was called "Spindle's Creek West" in the survey report. Collectors do not report this as a collecting locality, although several did mention finding quartz flakes occasionally west of Spindle's Creek. Ray Potvin reports finding a quartz small stemmed point, a quartz biface, and a quartz core in the general area. Thorstensen tested just to the south of this locus and found nothing (Chapter 3).

Five squares were selected randomly for excavation, and an additional three nonrandom squares were added in order to completely expose Feature 1. This area is apparently made of ice-channel filling deposits; soils are relatively uniform over the knoll, and are light and powdery to sandy in texture. The top 15 cm of soil in all test pits was dark brown (10YR 3/3) soil, with yellow-orange (10YR 6/8) fine soil extending from 15 to 35 cm below ground surface. The soil becomes yellower and gravelly or even cobbly at greater depths, and then becomes sandy again in some areas at about one meter depth. A faint podzol appears to be starting to form in some parts of the locus.

This was one of the least disturbed areas we tested, with no evidence that the locus had been plowed. It is a small peninsula leading away from the western fields, and its shape, location, and very steep drop off on three sides may have made it unsuitable for farming. There is one suspicious-looking pit near datum that may have resulted from pothunter activity. Pit S19E3 also appeared to have considerable tree root disturbance. There was little evidence of rodent activity at this locus.

Tables 10 through 14 document the materials found during our excavations

Table 10. Locus B Excavated Materials: Total Sample (N=8m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0		2 .7				15 34.8	
5							
10	4 .5	17 12.9		7 7.1	6 70.0	16 58.0	
15	1 .3	28 12.9	#2	24 25.0	45 1829.0	4 .6	F1 F2
20	1 .1	3 1.0		154 137.3	36 648.0		
25			#1,3,4,5,6	151 97.8	79 15503.0		
30				30 27.9	31 668.0		
35				12 5.7	25 292.0		
40				5 2.1	12 225.0		
45				2 1.1			
50				2 1.5			
T	6 .9	50 27.5	6	387 305.6	234 19235.0	35 93.4	

Table 11. Locus B Excavated Materials: Random Sample (N=5m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0		2 .7				13 31.0	
5							
10	4 .5	17 12.9		5 3.9	6 70.0	16 58.0	
15	1 .3	28 12.9	#2	14 22.6	15 585.0	4 .6	F1 F2
20	1 .1	3 1.0	#3, #6	63 81.9	30 576.0		
25				56 44.1	57 14256.0		
30				22 12.0	8 221.0		
35				8 1.7	7 43.0		
40				2 1.5	11 40.0		
T	6 .9	50 27.5	3	170 167.7	156 15791.0	33 89.6	

Table 12. Locus B Ceramics (Total Sample)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#1	S9E13 5-20 cm  S11W6 15-20 cm	2	1.3	fine- grit	grey- black	.3-.4	smooth	smoothed cordmarked	—	—
#2	S9E13 5-15 cm	1	.4	grit	yellowish	>.3	—	—	—	—
#3	S13E12 15-20 cm	47	25.8	fine- medium shell	medium brown	.52-.66	smooth	linear stamped, parallel to rim	castellated, linear stamped across rim	collared, necked; mouth diameter 25 cm, body 30 30 cm

Table 13. Locus B Lithic Artifacts (Total Sample)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
1 (207/1912)	S4E9	grey-green quartzite	3.3	2.7	.5	3.9 gm	Levanna projectile point, .5cm broken from tip (Figure 29d)
2 (207/2262)	S9E13	dark grey felsite	2.2	1.8	.5	1.4 gm	Madison projectile point (Figure 30c)
3 (207/2210)	S3E10	white granite	8.7	6.2	5.0	367.0 gm	hammerstone
4 (207/2309)	S4E10	yellow granite	7.5	6.4	6.0	388.0 gm	hammerstone
5 (207/2300)	S4E10	white quartz	6.2	5.2	3.6	123.0 gm	core
6 (207/2255)	S19E3	pink quartz	4.1	2.7	1.7	20.0 gm	core

Table 14. Locus B Fire Cracked Rock (Total Sample)

FCR	Merrimack Quartzite	Granite	Slate	Diorite	Quartz	Other Quartzite	Total
Number	210.0	21.0	9.0	6.0	4.0	3.0	253.0
% by Number	83.0	8.3	3.6	2.4	1.6	1.2	100.1
Weight in Grams	9264.0	3966.0	743.0	1645.0	3293.0	361.0	19272.0
% by Weight	48.1	20.6	3.8	8.5	16.9	16.9	99.8

at this locus. Bone was found in only one test pit, S13E12, which also produced a large number of sherds of shell-tempered ceramics. The two kinds of remains are probably functionally related, but it is also possible that the shell-tempered ceramics neutralized soil acidity to some extent in the immediate area. The bone included three fragments of turtle shell (.6 gm), one fragment of bird bone (.2gm), one unidentifiable bone fragment (.1 gm), and one fragment of unidentifiable shell (.3 gm). No nutshells or seeds were recovered in the excavation or in flotation of feature contents.

Ceramics are primarily if not totally Late Woodland in style, and the largest number, all from vessel 3, are associated with Feature 2 (Figure 32h). Stone artifacts include two projectile points, two hammerstones, and two cores. Projectile point 1 is carefully made of very fine, nearly translucent quartzite (Figure 29d). About five mm of the tip is missing, and no wear is visible on the edges or base of the point. Typologically, this artifact fits within the range defined for Levanna points (Ritchie 1971). It was found inside and just above Feature 1. Artifact 2 was found in association with vessels 1 and 2, Late Woodland in age (Figure 30c). Typologically, it fits within the range defined by Ritchie for Madison points (Ritchie 1971); its concave base and rounded edges could make it appear to be a Squibnocket triangle, but its association and nearly concave sides make it more likely to be a Late Woodland form. There is a bit of polishing or rounding wear visible under the microscope near the tip of the point.

Both hammerstones were found close to or in Feature 1, associated with a large quantity of quartz chipping debris. Both show considerable battering on corners and edges. One core was also found near this feature, while the other was found elsewhere. There were no signs of wear on either core.

Debitage at this locus was remarkable for its homogeneity; although a few grey felsite flakes were found here during survey, all the flakes from the

excavations were quartz. Therefore, no table of flake raw material types was prepared for this locus. Most were associated with Feature 1, where they occurred just above, around, and near the base of the feature. This debitage includes one core, 28 medium flakes (7.2%), 128 small flakes (33.0%) and 231 tiny flakes (59.8%), indicating that biface reduction was probably occurring at this location. Of these flakes, 9.5% showed cortex remnants. Fire cracked rock was found in most squares, but the greatest volume was obviously from Feature 1. A representative sample of the rocks from this feature was collected, so the figures in the tables do not represent the total volume of rock in the feature.

Historic artifacts are confined to the top few centimeters of this locus, and increase in density toward the fields to the west and south of the locus. Historic artifacts include nails, rusty metal, wire, coal fragments, fragments of bottles and a glass jar, a 22 caliber shell casing, and a rusted triangular file. There were also three coins: an 1864 Indian head penny, an 1892 dime, and a 1971 penny. All artifacts appear to date to the later nineteenth and twentieth centuries, and seem most consistent with use of the area for occasional picnics and for eating lunch when working in the nearby fields.

Locus B produced two features. Feature 1, located in the block of squares at the north end of our excavations at the locus, is a large bowl-shaped cobble-lined hearth which was probably dug below the existing land surface (Figure 11). It measures 120 cm in east-west dimension, and 130 cm from north to south. The outer edge of the feature began about 13 cm below ground surface, while the top of the center of the hearth lay at 24 cm. The base of the hearth is at a depth of about 35 cm. The hearth was constructed of a single layer of cobbles, some of which appeared to have been procured from the river bed. The rocks were generally large and rounded, with the largest rocks near the center and base of the hearth. The soil outside this feature



Figure 11. Locus B, Feature 1. Southeast quarter of cobble-lined hearth in S4E12.

was reddened a bit. There was a great deal of charcoal in the feature, most of it from conifer woods, but no bone or ceramics. As stated above, much quartz debitage and two hammerstones were found in and around the feature, and projectile point #1 was found just above it. Charcoal from this hearth produced a radiocarbon date of  $1680 \pm 125$  BP (GX-9001, carbon 13 corrected), or around AD 270.

Feature 2, located in square S13E12, is a small area of darkened and reddened soil filled with hard-packed pebbles. The feature began about 15 cm below ground surface and extended to 20 cm. It was oval and basin shaped, measuring 46 cm from northwest to southeast and 40 cm from northeast to

southwest. Both dicot and conifer charcoal fragments were found in and around the feature, but virtually no fire cracked rock was found. The feature was associated with bone fragments and with vessel 3.

The unusual homogeneity of the debitage from this locus suggests a single occupation. However, Feature 1 is dated to the Middle Woodland and Feature 2 has clear Late Woodland associations; in addition, one collector said he had found a small stemmed point, presumably Late Archaic in age, near the locus. The area was apparently used occasionally for transient camps at several time periods. Middle Woodland people apparently built the hearth and knapped local quartz here; the complete lack of associated domestic debris suggests a special function for the feature, perhaps that of a sweathouse, or else temporary use by an all-male group. Late Woodland artifacts are associated with domestic debris, suggesting use by a family or mixed-sex group.

#### LOCUS C

Locus C is also known as "Spindle's Creek East" (Mahlstedt 1981), and is an area approximately 1200 square meters located on the western remnant of the main ridge of ice-channel deposit (Figures 12 and 13). The steep drop shown on the map to the east and south of the locus indicate where the remainder of the kame terrace was bulldozed away. The locus slopes gradually to a low level area on the west, where numerous remnants of a historic house foundation can be seen. The edges of this locus are 50 meters from Spindle's Creek and 192 meters from the Merrimack. It is now covered by a grove of trees and is relatively clear of undergrowth except along its edges. The elevation of datum C is 18.7 meters above mean sea level.

This locus was discovered during the survey when a sherd, some flakes, and a few fragments of fire cracked rock were encountered in test pits. Notes from the Berry collection state that Berry found a ground stone tool and a



Figure 12. Locus C, Site View from East. Stone-lined drainage ditch in foreground.

metal pendant in this area; the latter does not appear to be prehistoric (Kenyon, personal communication). In addition, Ray Potvin states that he found a Merrimack point in this area or just to the east of it. The area was not considered particularly profitable by the collectors.

A random sample of seven one meter squares was excavated at this locus. Soil profiles indicate that the area may have been plowed at one time, although not recently. One square produced possible east-west plow scars, but the other squares did not have visible plow scars. A stone wall running along the west side of this locus may indicate the boundary of an old field or pasture. The average soil profile for the locus included 0-20 cm of medium brown (10YR 3/2)

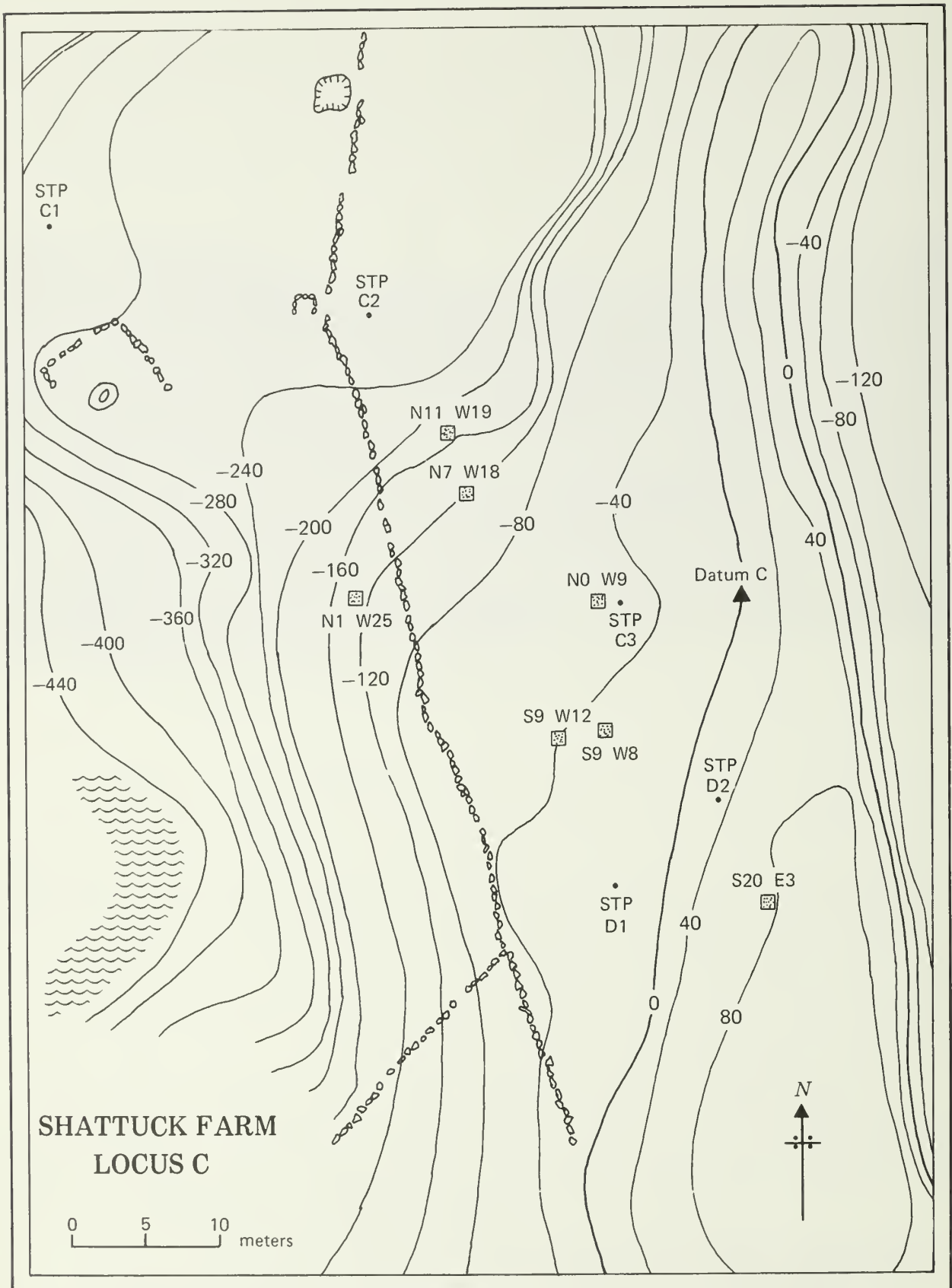


Figure 13. Map of Locus C.

silty soil containing some historic artifacts and possibly representing a plow zone. From 20 to 50 cm in depth the soil was fine orange (10YR 5/6) sandy silt with some gravel, and from 50 cm to at least one meter in depth the soil was light yellowish grey (2.5Y 6/4) sand. There was little evidence of rodent disturbance.

Materials found at this locus are described in Tables 15 through 20. Bone was found in five of the squares, and includes two turtle shell fragments (.4 gm), one bird bone fragment (.2 gm), three mammal bone fragments (.6 gm), nine unidentifiable bone fragments (.8 gm), and one shell fragment that may be oyster and may be from the historic period (3.6 gm). Several hickory nut shells were also found. Ceramics include Early, Middle, and Late Woodland styles (Figure 32a). Only two lithic artifacts were found, both in square S9W12 and associated with vessel 8. Tool 1 is a narrow, bifacially chipped tool that appears superficially to be shaped like the broken tip of a drill. However, its tip is more like a chisel in shape, and shows wear and striations that indicate it has been used to cut. The degree of wear also suggests that it may have been used on relatively hard materials such as wood or bone. The second tool is a small flake scraper with about 1.1 cm of working edge on its distal end. There is little clear wear on the edge, but some near a corner of the working edge also suggests use on harder materials.

Flakes of only two materials, quartz and grey felsite, were found. Grey felsite flakes were found in most squares, but quartz was found only in NOW9, in association with Feature 1. Flake size distributions include 4.8% medium flakes, 66.7% small flakes, and 28.6% tiny flakes, with 4.8% of all flakes showing cortex. All flakes appear to be finishing or retouch flakes; stone working was clearly not an important activity at this locus. Fire cracked rock in low quantities was found in all squares, with no particular concentrations evident. The survey did encounter a considerable concentration of fire cracked rock in

Table 15. Locus C Excavated Materials: Random Sample ( $N=7m^2$ )

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0				1 3.4	10 344	15 47.8	
5				6 1.8	7 242	74 73.0	
10				7 1.7	11 491	13 55.7	
15	1 .1	34 12.9	#2	5 2.6	36 836	10 14.7	F2
20	9 4.6	29 9.3	#1	2 .8	25 491	4 6.2	
25	1 .1	11 9.5		2 1.2	15 164		
30	1 .2	4 6.2		2 .5	27 617		F1
35	3 .5	21 40.1		3 .4	3 85		
40	1 .1	52 113.3					
T	16 5.5	189 201.8	2	28 12.4	134 3270	116 197.4	

Table 16. Locus C Ceramics (Total Sample)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#1	NOW9 30-40 cm	77	152.3	coarse grit	light brown	.6-.84 cm	cordmarked	cordmarked	rounded to tapered and diagonally impressed by paddle edge	coil breaks, slight neck
#2	NOW9 5-25 cm	3	1.3	shell	light brown, sandy	.5-.6 cm	smooth	smoothed cordmarked	_____	coil breaks
#3	N7W18 0-30 cm	40	11.2	shell	medium brown	.6-.75	smooth	cordwrapped stick impressed	rounded, cordwrapped stick roll- ed over rim	
#4	N7W18 5-20 cm	12	3.2	fine shell	dark grey	.7	smooth	cordwrapped stick impressed	_____	_____
#5	N7W18 0-25 cm	29	13.6	medium grit	dark greenish brown	.8	smooth	smooth, burnished	_____	_____
#6	S9W8 15-30 cm	4	4.0	medium grit	sandy, reddish	.75	smooth	net impressed	_____	_____
#7	S9W8 15-20 cm	5	3.5	medium grit	yellowish brown	.8	smooth	fine cordmarked, parallel to rim	_____	neck, 15 cm in diameter

Table 16. Locus C Ceramics (Total Sample) - Continued

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#8	S9W12 5-25 cm	14	2.4	medium grit	medium brown	>.7	cordmarked	cordmarked	—	—
#9	S20E3 15-20 cm	1	.2	fine shell	black	.45	smooth	smooth	flattened	—
#10	S20E3 20-25 cm	3	5.2	medium grit	reddish, sandy	.75	cordmarked	cordmarked	—	—

Table 17. Locus C Lithic Artifacts (Total Sample)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
1 (207/1546)	S9W12	black felsite	1.5	.9	.4	.6	biface-chisel knife?
2 (207/1545)	S9W12	grey felsite	1.9	1.2	.4	.7	utilized flake, scraper

Table 18. Locus C Flake Numbers and Weights (Total Sample)

Depth	Quartz # gms	Grey Felsite # gms	Total # gms
0			
5		1 3.4	1 3.4
10	1 .3	5 1.6	6 1.9
15		7 1.7	7 1.7
20	1 .3	4 2.3	5 2.6
25		2 .8	2 .8
30		2 1.2	2 1.2
35	2 .5		2 .5
40	3 .4		3 .4
T	7 1.5	21 11.0	28 12.5

Table 19. Locus C Flake Percentages (Total Sample)

Depth	Quartz # gms	Grey Felsite # gms
0		
5		100.0
10	16.7 16.2	83.3 83.3
15		100.0
20	20.0 11.5	80.0 88.5
25		100.0
30		100.0
35	100.0	
40	100.0	
T	25.0 12.0	75.0 88.0

Table 20. Locus C Fire Cracked Rock (Total Sample)

FCR	Merrimack Quartzite	Granite	Other Quartzite	Diorite	Quartz	Slate	Total
Number	110.0	2.0	13.0	4.0	3.0	2.0	134.0
% by Number	82.1	1.5	9.7	3.0	2.2	1.5	100.0
Weight in Grams	2771.0	26.0	174.0	140.0	87.0	72.0	3270.0
% by Weight	84.0	.8	5.3	4.3	2.7	2.2	100.0

some shovel test pits in this area, however.

Historic artifacts are probably related to the historic house foundations located near Spindle's Creek to the west of this locus. They include brick fragments, square nails, glazed ceramics, coal, window glass, and miscellaneous metal fragments, all apparently dating from the late nineteenth or early twentieth century. There were also a few items that may be more recent, including a 22 caliber bullet slug, a 38 caliber target slug, the top of a beer can, and some beer or soft drink bottle glass.

One historic feature, apparently a stain from a fence post, was found in S9W8, and two prehistoric features were also found. Feature 1 is a small pottery concentration, located in NOW9 and composed entirely of vessel 1. It lay between 34 and 39 cm in depth, and was shaped like a 25 cm by 35 cm oval, oriented roughly north-south. It lay just east of a large cobble and was associated with a quantity of fire cracked rock, fragments of conifer and dicot charcoal, fire quartz flakes, and two hickory nut shells. This feature may represent the spot where vessel 1 was dropped and broken, or where its pieces were swept to remove them from living areas.

Feature 2 was a pit located in square N1W25. It was roughly oval and elongated north-south, measuring 70 cm by about 60 cm. The top of the pit was truncated by a large tree root and possibly by plowing (Figure 14). The present top of the pit is 22 cm below the ground surface, and it extended to about 42 cm. It was basin shaped and contained nothing except a few small fragments of firecracked rock, small fragments of conifer charcoal, and more numerous fragments of charred dicot bark. More fire cracked rock and several unidentifiable bone fragments were found above and just outside the pit, but no ceramics or lithic materials were found in this square. The bark and lack of other contents suggests this may have been



Figure 14. Locus C, Feature 2. Pit, cross-sectioned in east wall of N1W25.

a small storage pit, and its depth suggests that it is of Middle or Late Woodland age. However, no radiocarbon dates have been run as yet.

In summary, this area was definitely occupied during the Early, Middle, and Late Woodland; occupation during other periods cannot be ruled out, however, by the limited testing done thus far. The later prehistoric materials are in disturbed context, probably due to plowing, but some of the Early Woodland material appears to be in situ, and is associated with nutshells, bones of bird, turtle, and mammal, and two small tools which may have been used in working wood or bone. This locus was not heavily used, in general, but appears to be the edge of an area that was more regularly occupied and used, the missing kame terrace. Further discussion of the role this locus played in the total picture of occupation at Shattuck Farm will be found later in this chapter and in Chapter 7.

#### LOCUS D

Locus D is located to the east of the confluence of Spindle's Creek and the Merrimack River (Figures 15 and 16). It covers an area of approximately 5000 square meters and is essentially adjacent to both of the above watercourses. Elevation of Datum D, at the northeast corner of the Hewlett-Packard fence, is 15.8 meters above mean sea level and again, contours shown on Figure 16 do not reach all the way to the edge of the river. Most of this area is in plowed field, except for a strip of oak and pine trees along the banks of the river.

This locus was well known to collectors and its productivity was confirmed by the 1980 survey which recovered many flakes and sherds, along with a few lithic artifacts, in shovel test pits. This was also the area of one of Thorstensen's excavations in 1971. Collectors report finding many small stemmed points and Atlantic points in this area, as well as hammerstones, a gorget, and fragments of worked slate. This locus is referred to in the survey



Figure 15. Locus D, Site View from East.

report as the "Confluence of Spindle's Creek Site." Testing indicated that it is to a certain extent continuous with locus E, but the density of artifacts is greatest at the western edge of locus D, while locus E has more artifacts to the east. It is clear that the former locus is focussed on Spindle's Creek and the latter on the marsh, with an area of overlap in between.

We limited our testing to the area north of the Hewlett-Packard fence line, because the area south of this line had not been very productive in survey shovel test pits (Mahlstedt 1981:28) and was newly planted in corn when we began our excavations. We also hoped that the areas closest to the river would be less disturbed by plowing. We chose a random sample of 12

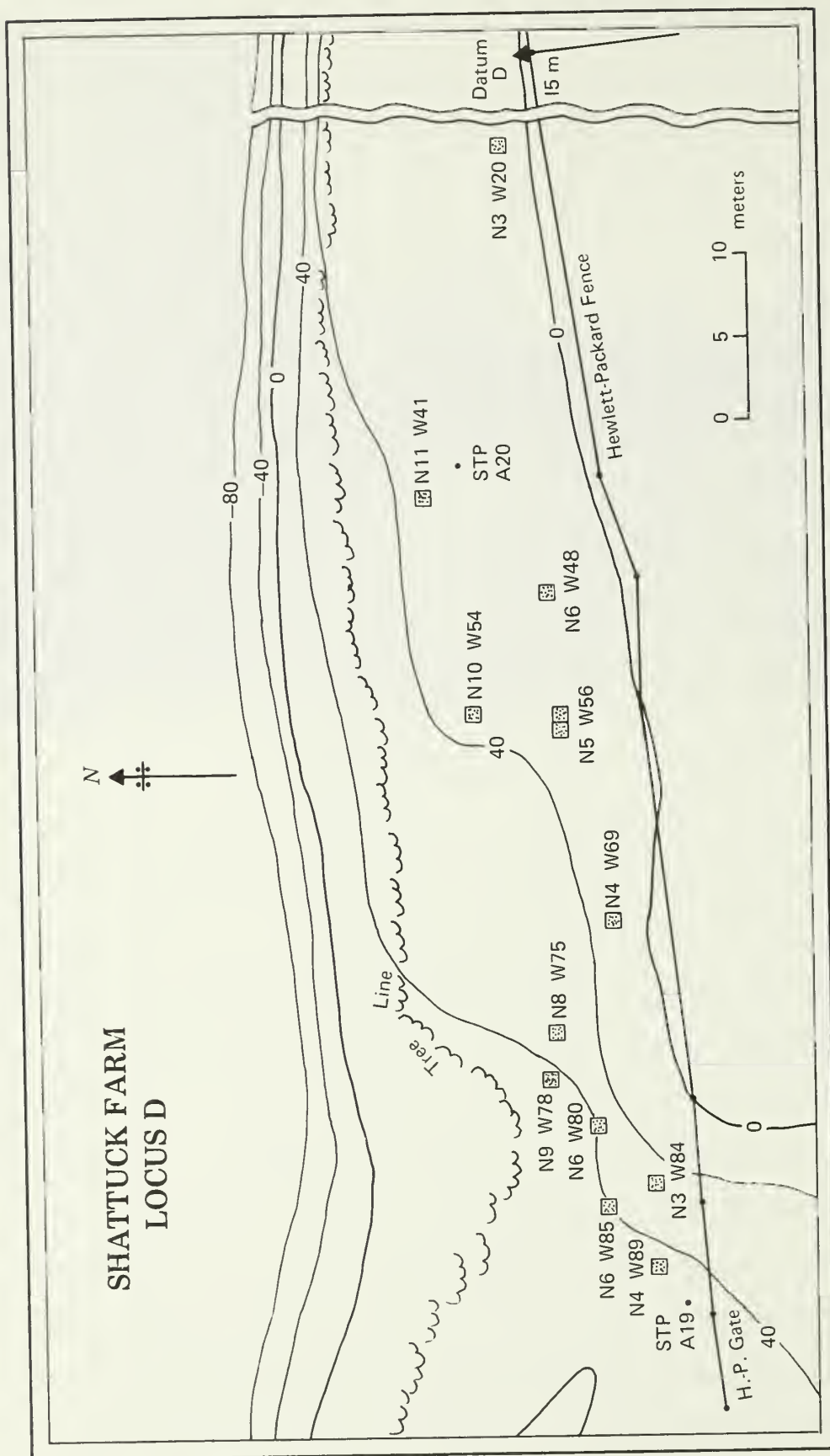


Figure 16. Map of Locus D. Navy vertical lines = 15 meters not included on map.

squares in this zone, and added a 13th nonrandom square to expose all of Feature 5. These squares were originally measured in from the fence line, under the erroneous assumption that it ran east-west, and thus square designations do not agree with actual square locations north of datum.

Plow scars were found in all squares, running east-west for the most part but running from north to south in squares close to the river. The plow zone also appeared to be thinner and the scars were more distinct close to the river. This suggests that in the early days of Shattuck Farm, before the river edge had eroded and before the dirt road along the river was made, fields were laid out perpendicular to the river (cf. locus A). Later there was a switch to the present pattern with fields oriented and plowed parallel to the river. The stratigraphy for all areas was dark brown (10YR 5/3) sandy loam for 0-25 cm, orange (10YR 6/8) fine sandy loam for 25-50 cm, and below 50 cm, light yellow (10YR 7/6) sand grading into white and grey sand. All sediments are quite fine, with very few pebbles that were not culturally introduced. There little evidence of rodent burrowing in most areas.

A wide variety of materials were recovered from this locus (Tables 21 through 27). Bone from locus D included 55 fragments of turtle shell (4.1 gm), four fragments of bone from a large mammal (2.6 gm), four fragments of general mammal bone (1.0 gm), 14 fragments of bird bone (1.45 gm), 309 fragments of unidentifiable bone (24.8 gm), and one fragment of shell that might be oyster (.4 gm). In addition, about 20 fragments of nut shell were found, most of which were hickory but a few of which may be walnut. Organic remains were sparse in most pits at this locus; over 70% of the bones found were from one square, N6W85, all in association with Feature 3. It is notable that all the bird bone and all but one of the nut shells were from the two westernmost pits, closest to Spindle's Creek.

Ceramics were also unevenly distributed among the squares, with a marked

Table 21. Locus D Excavated Materials: Total Sample (N=13m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0							
5	7 1.4	152 63.0	#9	102 80.2	87 2137.0	7 2.2	
10	7 1.8	175 76.4		120 94.6	59 1084.0	6 7.4	
15	7 3.0	273 102.4	#8, 24, 27, 29	184 135.3	54 928.0	7 5.4	
20	8 1.3	289 122.0	#4, 10, 16, 18, 20, 23	186 117.7	73 2359.0	6 35.2	
25	44 6.4	312 136.2	#3, 12, 25	218 244.1	98 2210.0	14 37.6	F3
30	94 6.0	292 124.8	#1, 13, 28	342 298.6	135 3916.0	5 3.6	F1
35	179 11.4	92 41.5	#11, 14, 15, 19	332 292.6	58 2067.0		F4 F5 F6
40	32 2.6	71 30.8	#2, 5, 6, 17, 21, 22, 26	341 128.0	16 415.0		F2
45	8 .6	41 24.9	#7	166 31.0	14 475.0		
50	2 .4	1 .5		12 8.2	15 184.0		
55		3 1.0		5 25.1	1 15.0		
T	388 34.9	1701 723.5	29	2008 1455.4	610 15790.0	45 91.4	

Table 22. Locus D Excavated Materials; Random Sample (N=12m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0							
5	3 1.0	126 52.2	#9	79 66.5	74 1524.0	2 1.0	
10	7 1.8	175 76.4		120 94.6	59 1084.0	6 7.4	
15	7 3.0	265 98.6	#8, 27	178 128.3	49 902.0	5 3.8	
20	5 .9	275 115.0	#4, 10, 16, 18, 20, 23	167 111.6	67 1947.0	6 35.2	
25	42 6.0	297 130.4	#3, 12, 25	191 228.6	89 2050.0	11 26.1	F3
30	93 5.8	288 123.6	#1, 13, 28	338 296.6	130 3901.0	4 1.2	F1
35	176 11.2	92 41.5	#14, 15, 19	330 292.1	58 2067.0		F2
40	32 2.6	71 30.8	#2, 5, 6, 17, 21, 22, 26	341 128.0	16 415.0		
45	8 .6	41 24.9	#7	166 31.0	14 475.0		
50	2 .4	1 .5		12 8.2	15 184.0		
55		3 1.0		5 25.1	1 15.0		
T	375 33.3	1634 694.9	26	1927 1410.6	572 14564.0	34 74.7	

Table 23. Locus D Ceramics (Total Sample)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#1	N3W20 0-20 cm	7	3.0	shell	gritty, brown	.5-.65	smooth	smooth	flat	—
#2	N3W20 0-45 cm	3	1.0	medium grit	medium brown	>.45	smooth	smooth	—	—
#3	N3W20 15-40 cm	10	3.8	shell	brown	.90	smooth	cord impressed	flat	—
#4	N3W20 20-25 cm	3	1.3	shell	brown	>.50	smooth	dentate stamped, in large triangles	—	—
#5	N4W69 N5W55/6 N6W48 N10W54 0-45 cm	86	34.1	shell	medium brown	.5-.75	smooth	faint incising	flat & slightly everted	—
#6	N6W48 N10W54 N5W55/56 N11W41 0-25 cm	28	8.8	shell	medium brown	.47-.75	smooth	cordmarked	—	—
#7	N10W54 N5W55 N6W48 10-45 cm	6	2.3	medium grit	sandy, reddish	.7-.85	smooth	smoothed cordmarking	—	—

Table 23. Locus D Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#8	N10W54 N5W55 0-30 cm	7	2.3	medium grit	medium brown	.5-.8	smooth	comb impressed, with smoothed cordmarking below	flat, comb impressed	—
#9	N5W55/6 N4W69 N4W11 0-30 cm	50	20.8	shell	dark grey	.5-.75	smooth	cordwrapped stick impressed	—	—
#10	N5W55 0-10 cm	5	1.2	shell	brown	>.5	smooth	small punctations	—	—
#11	N4W69 N5W55/6 0-27 cm	7	5.45	shell	dark brown- black	.4-.75	smooth	fabric impressed?	rounded and everted	—
#12	N5W55 15-20 cm	9	5.3	shell	brown	.8	smooth	scallop wiped?	—	—
#13	N5W56 20-25 cm	3	1.55	medium grit	brown	.65-.8	smooth	dentate stamped; oval teeth, tool 1.5 cm long	—	—
#14	N5W56 27-35 cm	2	7.3	medium grit	brown	.6-.8	smooth	rocker dentate stamped, 7 teeth, tool 2.5 cm long	rounded, rocker teeth impressed inside & out	—

Table 23. Locus D Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#15	N4W69 0-25 cm	15	7.0	medium grit	sandy, brown	.7	smooth	smoothed cordmarking	—	—
#16	N5W56 N4W69 0-35 cm	15	10.5	fine grit	dark brown, slightly sandy	.4-.6	smooth	smooth	rounded	necked, coil break
#17	N8W75 N9W78 0-30 cm	96	43.8	coarse shell	brown	.6-.8	smooth	smooth	rounded to flat- tened	coil break
#18	N8W75 0-15 cm	11	9.35	medium grit	brown	.7	smooth	dentate stamped	—	—
#19	N8W75 0-25 cm	15	8.5	shell	greyish brown	.65	smooth	reed drag and jab	rounded	—
#20	N8W75 10-15 cm	1	.4	grit & shell	brown	.4	smooth	smooth	—	—
#21	N8W75 N6W80 10-30 cm	99	37.75	coarse shell	brown	.8-.85	smooth	diagonal cordwrapped stick impressed	—	—
#22	N8W75 10-20 cm	3	2.45	medium grit & shell	brown	.5-.75	smooth	smooth	rounded, linear stamped under rim	

Table 23. Locus D Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#23	N8W75 N9W78 5-25 cm	20	20.4	medium grit	medium brown	.55-.8	smooth	oval dentate stamped	flat, maybe stamped	—
#24	N8W75 25-30 cm	5	6.2	medium grit	brown	.45-.65	smooth	dentate stamped, 3 teeth, tool= 1 cm long	flattened, stamped diagon- ally	—
#25	N8W75 N9W78 N6W80 N3W84 0-40 cm	190	49.6	shell	medium brown	.55-.8	smooth	cordmarked	rounded to slightly flat, tip- ped to inside	—
#26	N8W75 15-20 cm	2	1.0	shell	brown	.5-.75	smooth	incised lines	—	—
#27	N8W75 30-35 cm	3	8.6	coarse shell	brown	.8	smooth	smooth	—	coil break
#28	N9W78 5-20 cm	10	6.5	medium grit	medium brown	.45-.65	smooth	smooth	—	—
#29	N9W78 N6W80 10-20 cm	4	.8	shell	medium brown	.3-.4	smooth	horizontal cordmarked	flat, tipped to inside	mini- ature

Table 23. Locus D Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#30	N9W78 0-20 cm	9	4.0	medium grit	brown	.5	smooth	comb impressions, vertical along out- side of rim	flat, tipped to out- side	---
#31	N9W78 15-20 cm	6	3.4	medium grit	sandy, brown	.5	smooth	smooth, added node	---	---
#32	N9W78 15-20 cm	1	1.1	shell	brown	.6	smooth	cord wrapped stick impression	---	coil break
#33	N6W80 N3W84 N6W85 0-30 cm	90	54.45	medium grit	sandy, reddish	.45-.7	smooth	dentate stamped	flat	---
#34	N9W78 N6W80 N3W84 5-35 cm	42	14.05	medium grit	brown	.6	smooth	comb impressed lines, vertical just under rim, in & out; hori- zontal below	rounded	---
#35	N9W78 20-30 cm	5	4.75	medium grit	brown	.6	smooth	comb or stick impressed, diagonally below rim	flat, maybe impressed	---

Table 23. Locus D Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#36	N9W78 N6W80 0-35 cm	6	11.1	coarse grit	brown	.7-1.0	cordmarked	cordmarked	—	—
#37	N6W80 5-35 cm	5	16.2	shell	brown	.45-.65	smooth	smooth with some incising	—	—
#38	N6W80 15-25 cm	74	24.0	fine shell	dark brown	.5-.6	smooth	impressed lines parallel to rim	flat, tipped to out- side	—
#39	N6W80 20-25 cm	13	5.6	medium grit	brown	.45-.5	smooth	faint incising or brushed design	—	—
#40	N6W80 25-40 cm	9	6.1	medium grit	brown	.55-.7	smooth	scallop impressed	—	—
#41	N3W84 0-30 cm	55	14.7	shell	medium brown	>.5	smooth	incised	pointed	—
#42	N6W80 N3W84 5-20 cm	2	2.3	fine grit	medium brown	.6-.75	smooth	fine cordmarking	—	—
#43	N3W84 10-15 cm	17	4.8	shell	reddish brown	>.4	smooth	reed impressed	—	—

Table 23. Locus D Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#44	N3W84 10-30 cm	88	23.8	shell	brown	>.5	smooth	reed half-moon impressions	—	—
#45	N6W80 N3W84 10-25 cm	6	3.2	medium grit	brown	.6-.8	smooth	dentate rocker stamped	rounded	—
#46	N3W84 N4W89 0-15 cm	5	2.4	fine grit	black	.6-.7	smooth	smoothed cordmarking	—	—
#47	N3W84 5-55 cm	11	3.9	shell	brown	.6-.75	smooth	fine cordmarking	—	—
#48	N3W84 10-40 cm	2	4.7	fine grit	dark brown	.45-.5	smooth	cordwrapped stick impres- sions, diagonal	rounded	—
#49	N6W85 15-20 cm	2	.5	shell	brown	.5-.6	smooth	incised	—	—
#50	N6W85 0-10 cm	4	1.65	medium grit	brown	>.6	smooth	reed drag and jab	—	—
#51	N6W85 0-40 cm	88	36.0	shell	brown	.5-.7	smooth	scallop shell impressed	—	coil break
#52	N6W85 10-20 cm	2	1.0	shell	brown	.45-.65	smooth	reed punctate	pointed	—

Table 23. Locus D Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#53	N6W85 20-25 cm	54	19.1	medium grit	brown	.5-.7	smooth	cordwrapped stick impressed	---	---
#54	N4W89 0-45 cm	141	67.75	medium grit	reddish brown	.55-.9	smooth	dentate stamped	rounded	---
#55	N6W85 N4W89 10-30 cm	16	7.2	shell	brown	>.3	smooth	cordmarked	---	---
#56	N3W84 20-25 cm	9	4.5	fine grit	dark brown	.6	smooth	cord impressed (rows .35 cm apart, horizon- tal)	---	---
#57	N3W84 5-55 cm	106	26.9	shell	yellowish brown	.5-.75	smooth	cord impressed below rim, single cord	flat	---
#58	N6W85 20-25 cm	5	4.8	fine grit	dark brown	.5-.8	smooth	smoothed cordmarking	rounded	---
#59	N4W89 0-35 cm	41	15.6	shell	brown	.6	smooth	smoothed	---	---

Table 24. Locus D Lithic Artifacts (Total Sample)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
1 (207/741)	N3W84	brown basalt	3.0	1.5	.5	2.0	expanding stemmed projectile point (Figure 30d)
2 (207/751)	N3W84	white quartz	1.8	1.3	.6	1.4	triangular projectile point (Figure 29f)
3 (207/832)	N8W75	grey felsite	2.4	1.7	.6	2.1	triangular projectile point (Figure 30g)
4 (207/667)	N9W78	dark grey felsite	3.6	3.3	.6	5.8	large triangular projectile point, broken and re-used as drill (Figure 30h)
5 (207/689)	N9W78	grey felsite	2.2	1.8	.7	2.0	straight stemmed projectile point (Figure 30e)
6 (207/690)	N9W78	white quartz	2.0	1.8	.6	1.9	triangular projectile point (Figure 29e)
7 (207/1074)	N10W54	light grey quartz	3.8	1.6	.9	4.9	small stemmed point, stem broken
8 (207/779)	N11W41	dark grey-brown quartzite	3.4	1.3	.7	3.1	small stemmed projectile point (Figure 30f)

Table 24. Locus D Lithic Artifacts (Total Sample) (Continued)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
9 (207/856)	N4W69	grey ashy felsite	6.0	3.5	1.2	29.2	broken biface used as knife (Figure 30i)
10 (207/901)	N6W80	grey-white quartz	2.5	1.5	.8	3.1	broken biface
11 (207/1198)	N5W55	yellowish-green rhyolite	2.6	2.0	.7	3.6	scraper
12 (207/970)	N6W85	yellowish-pink quartz	1.7	1.4	.7	1.6	square corner of biface
13 (207/945)	N6W85	grey-green felsite	3.4	1.8	.9	4.9	broken biface-knife? (Figure 30j)
14 (207/685)	N9W78	white quartz	3.7	2.1	1.0	7.3	small thick irregular biface
15 (207/685)	N9W78	white quartz	3.7	2.3	1.3	10.1	small biface
16 (207/1045)	N10W54	light grey quartzite	3.7	3.3	.7	8.5	broken base of stemmed biface
17 (207/1082)	N10W54	white quartz	3.8	2.5	1.4	12.1	thick biface
18 (207/906)	N6W80	Merrimack quartzite	2.1	2.0	1.0	6.1	fragment of abraded

Table 24. Locus D Lithic Artifacts (Total Sample) (Continued)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
19 (207/956)	N6W85	dark grey slate	6.4	4.8	1.0	6.1	broken ulu (Figure 31a)
20 (207/1163)	N4W89	light grey quartzite	1.1	1.2	.5	.6	fragment of ground and polished stone
21 (207/749)	N3W84	Merrimack quartzite	10.7	9.4	5.2	810.0	oval cobble anvil stone
22 (207/750)	N3W84	grey quartz	6.5	6.4	3.6	192.0	pebble hammerstone
23 (207/1376)	N3W20	white quartz	3.5	3.0	1.8	25.6	core
24 (207/1172)	N5W55	white quartz	3.0	2.2	1.7	9.7	core
25 (207/855)	N8W75	white quartz	4.7	4.5	3.7	78.4	core utilized as hammerstone
26 (207/847)	N8W75	white quartz	2.5	2.4	1.8	10.2	core
27 (207/659)	N9W78	white quartz	3.2	2.7	1.5	11.7	core
28 (207/794)	N11W41	grey-white quartz	6.2	4.8	4.8	136.2	core used as scraper
29 (207/1172)	N5W55	grey quartz	2.2	1.9	1.4	5.5	core

Table 25. Locus D Flake Numbers and Weights (Total Sample)

Depth	Quartz # gms	Grey Felsite # gms	Red- Brown Felsite # gms	Grey- Green Felsite # gms	Black Felsite # gms	Purple Felsite # gms	Blond Felsite # gms	Grey Rhyolite # gms	Tan Rhyolite # gms
0									
5	70 58.6	21 16.0	2 2.5					6 2.1	1 .4
10	91 77.4	21 13.8						7 3.0	
15	131 112.1	39 19.0	1 .3					13 3.9	
20	119 88.4	42 19.4		1 2.0	2 .3		1 .4	21 7.2	
25	171 123.7	33 15.4			2 3.3	1 3.8	1 3.3	7 1.8	
30	284 280.8	33 7.4		4 .8	10 5.9	1 .2		4 1.0	
35	236 240.8	77 41.8		1 .2	5 3.3	15 4.4		2 .7	
40	278 95.8	60 30.6				2 1.4	1 .2		
45	155 20.6	8 5.4		1 4.1	1 .6	1 .3			
50	10 5.5	1 2.3				1 .4			
55	5 25.1								
T	1550 1218.7	329 171.2	3 2.8	7 7.1	20 13.4	21 10.5	3 3.9	60 19.6	1 .4

Table 25. Locus D Flake Numbers and Weights (Total Sample) (Continued)

Depth	Saugus Rhyolite #	gms	Quartzite #	gms	Grey Chert #	gms	Black Chert #	gms	Onondaga Chert #	gms	Red Jasper #	gms	Yellow Jasper #	gms	Argillite #	gms	Total #	gms
0																	102	80.2
5					1	.2												
10									1	.4							120	94.6
15																	184	135.3
20																	186	117.7
25							1	1.9					1	.6	1	.3	218	244.1
30	1	.6	1	.3	1	.9					1	.2			2	.6	342	298.6
35	1	.9	1	.5													332	292.6
40																	341	128.0
45																	166	31.0
50																	12	8.2
55																	5	25.1
T	2	1.5	2	.8	2	1.1	1	1.9	1	.4	1	.2	1	.6	3	.9	2008	1455.5

Table 26. Locus D Flake Percentages (Total Sample)

Depth	Quartz # gms	Grey Felsite # gms	Red- Brown Felsite # gms	Grey- Green Felsite # gms	Black Felsite # gms	Purple Felsite # gms	Blond Felsite # gms	Grey Rhyolite # gms	Tan Rhyolite # gms								
0	68.6	73.1	20.6	20.0	2.0	3.1		5.9	2.6	1.0	.5						
5	75.8	81.8	17.5	14.6				5.8	3.2								
10	71.2	82.8	21.2	14.0	.5	.2		7.1	2.9								
15	63.9	75.1	22.6	16.5	.5	1.1	.2	11.3	6.1								
20	78.4	87.5	15.1	6.3	.9	1.4	.4	3.2	.7								
25	83.0	94.0	9.6	2.2	1.2	.3	2.9	1.2	.3								
30	71.1	82.3	21.4	14.3	.3	.1	1.5	.6	.2								
35	81.5	74.8	17.6	23.9		.6	1.1										
40	93.4	66.4	4.8	17.4	.6	1.9	.6										
45	83.3	67.1	8.3	28.0		8.3	4.9										
50	100.0																
55																	
T	77.2	83.8	16.4	11.8	.2	.3	.5	1.0	.9	1.0	.7	.1	.3	3.0	1.4	.05	.03

Table 26. Locus D Flake Percentages (Total Sample) (Continued)

Depth	Saugus Rhyolite #	gms	Quartzite #	gms	Grey Chert #	gms	Black Chert #	gms	Onondaga Chert #	gms	Red Jasper #	gms	Yellow Jasper #	gms	Argillite #	gms
0																
5	1.0	.5			.1	.2										
10									.8	.4						
15																
20																
25							.4	.8					.4	.2	.4	.1
30	.3	.2	.3	.1	.3	.3					.3	.07			.6	.2
35	.3	.3	.3	.2												
40																
45																
50																
55																
T	.1	.1	.1	.05	.1	.08	.05	.1	.05	.03	.05	.01	.05	.04	.1	.06

Table 27. Locus D Fire Cracked Rock (Total Sample)

FCR	Merrimack Quartzite	Granite	Other Quartzite	Diorite	Quartz	Sand- stone	Total
Number	500.0	63.0	24.0	8.0	7.0	1.0	603.0
% by Number	82.9	10.4	4.0	1.3	1.2	.2	100.1
Weight in Grams	12324.0	2176.0	706.0	394.0	137.0	27.0	15764.0
% by Weight	78.2	13.8	4.5	2.5	.9	.2	100.1

increase in the number of sherds from east to west. The seven easternmost squares averaged 38 sherds per meter square, while the six westernmost squares averaged 240 sherds per meter square. The majority of sherds are from Late Woodland vessels, with 10% of the vessels having fine grit temper and thin walls, 54% having shell temper, 34% having medium grit temper and decorative motifs typical of the Middle Woodland, and 2% having Early Woodland characteristics (Figure 32b, c, g, and i). The fine grit sherds were all in the four westernmost squares, but other types were distributed among all squares. There was also no vertical zoning of sherd types evident, and most sherds were found in the plowzone, though some were found as deep as 10 cm below the plowzone.

The majority of lithic artifacts also came from the plowzone, including four of the projectile points, four bifaces, an abrader, a fragment of a ground stone tool, and six cores. Artifact 1 is a side-notched projectile with a stem length of 1.05 cm, stem width of 1.1 cm, and a width at notches of 1.0 cm (Figure 30d). It is flat to lenticular in cross-section, and fits the

descriptions for Brewerton notched points. Heavy patination makes wear difficult to discern, but basal corners and shoulders did appear to be markedly worn, probably reflecting hafting wear. The broken tip also suggests that this point broke in use. Artifact 3 is a small triangular point with a concave base and relatively thick cross-section (Figure 30g). It fits within the size ranges for Squibnocket, Madison, or even Levanna points, and showed no obvious wear. Artifact 4 was a Levanna point, with tip and one corner broken off, which had then been re-used for a variety of piercing, scraping, and graving functions (Figure 30h). The one remaining corner had heavy wear extending .6 cm down from its tip, with striations indicating that motion of the tool had been parallel to the long axis of the corner. This corner was apparently used for piercing or graving, though not with rotary motion. The edges that had been the sides of the point were both heavily worn, especially around the broken corners. Wear was generally unifacial, and striations perpendicular to the edge suggested these edges were being used for scraping, perhaps functioning as spokeshaves. The base may also have been used in this way, but had then been reworked or sharpened with rather steep retouch. The considerable wear on this tool suggests that it was used on a highly resistant material such as bone or a hard wood. Artifact 8 is a thick, narrow stemmed point, perhaps a Rossville point but more likely a small stemmed point (Figure 30f). Edges on one side of the shoulders are heavily worn, and assuming this wear is the result of hafting, the stem length is 1.6 cm.

Several of the bifaces from the plowzone may also be fragments of projectile points. Artifact 10 is a narrow, thick, bifacially flaked object with both base and tip broken off. There is crushing and grinding wear along the edges. This may well be part of a small stemmed point. Artifact 12 is the corner of a square biface base with heavily worn edges, possibly as

a result of basal grinding or because the fragment was re-used as a scraper. It may have been from an Atlantic or Fox Creek-type blade. Artifact 16 is another stem, thin and carefully made, which could be from an Adena-type point. No wear was visible. The fourth biface from the plowzone, Artifact 9, is a lanceolate biface with a broad base and the tip broken off on a diagonal (Figure 30i). It has a little wear on all edges, and may have been used as a knife.

Two fragments of ground stone were found. The first, Artifact 18, is a small rectangle of sandstone with one face ground very flat and almost concave. It is assumed that this is a fragment of an abrader, although perhaps it was just a very small abrader. The second, Artifact 20, is a small fragment of a ground and highly polished perforated object. One face of the object is smooth and flat, and a perforation hole runs parallel to that face and only .35 cm from it. The perforation would have had a diameter of about .5 cm, and the striations in the perforation run parallel to the long axis of the perforation. The other surfaces are all broken. Perhaps this was part of a pendant, or an atl atl weight, although the perforation would seem rather small for the latter.

Artifacts 23, 24, 27, and 29 are unutilized cores; Artifacts 25 and 28 were utilized as a hammerstone and a scraper, respectively.

Seven artifacts were found below the plowzone and in levels that were still producing ceramics. They include two projectile points, three bifaces, an anvil stone and a hammerstone. The first projectile point, artifact 2, is a small quartz triangle with straight sides and base (Figure 29f). It fits the ranges for a Squibnocket triangle, a Beekman triangle, and a Jack's Reef pentagonal, and no wear was visible under the microscope. The second, Artifact 7, is a small, thick, narrow biface with the base broken off. There is no visible wear, and the point may have broken during manufacture. The point may

have been intended to be a small stemmed point.

Artifacts 14, 15, and 17 are all thick quartz bifaces with one end oval and the other slightly pointed. None had wear, and they are probably preforms. Artifact 21, the anvil stone, is a flattened oval stream cobble with small battered depressions on both faces, more on one than the other. There are also a few small battering marks on the sides of the stone. Artifact 22 is a stream-pebble battered around the sharp edges and protruberances. This hammerstone was found in the same square and level as the anvil stone, and they are therefore likely to have been used together.

Six artifacts were found in levels below the plowzone, and not in association with ceramics, including two projectile points, one biface, an ulu, a utilized flake, and a core. Artifact 5 is a small stemmed point with a wide triangular blade, obtuse shoulder angles, and a thick square base that ends in a natural fracture surface (Figure 30e). Stem length is 1.0 cm, stem width is 1.2 cm, and stem thickness is .7 cm. Some crushing is visible on the edges of the blade, and the edges of the base are a bit rounded. This point resembles a Lamoka point more than anything else, or possibly a Bare Island point. Artifact 6 is a small quartz triangle with one corner broken (Figure 29e). No wear is visible. This point is probably a Squibnocket triangle.

Artifact 13 is a leaf shaped biface with a broken base, and with cortex visible on one diagonal edge of the blade (Figure 30j). There was no wear visible, suggesting either that this was an unfinished point, or else that it was a knife that was not used. Number 11 is a flake that had been utilized as a scraper along an edge 2.2 cm long. Artifact 26 is a core.

Artifact 19, found just under Feature 3 is an ulu broken in half across the middle, perpendicular to the long axis (Figure 31a). This breakage appears to have been intentional, as there is a groove scratched parallel

to the break. The ulu has a ridge extending down 1.7 cm from the top. Thickness is 1.0 cm at this ridge and .5 for the working edge. The working edge is well worn and rounded, almost faceted, with striations perpendicular to the edge, suggesting that the tool had been used or re-used as a scraper.

Debitage from Locus D includes a wide variety of raw materials and was quite abundant in all squares. The highest density was in N9W78, where much of it seems to represent a single chipping episode for quartz. Quartz predominates for the locus as a whole, although grey felsite is in the majority for the three westernmost squares. This locus was the only one we tested that produced jasper. There were virtually no detectable vertical changes in raw material types.

Debitage size ranges include a relatively large proportion of larger flakes. For quartz, 3.5% of the flakes were large, 11.4% were medium, 61.4% were small, and 23.7% were tiny, with 5.4% having cortex. For grey felsite, 2.2% were big, 11.8% were medium, 59.1% were small, and 26.9% were tiny, with 4.6% showing cortex. For all other materials, 2.0% were big, 11.6% were medium, 83.6% were small, 2.7% were tiny, while 8.9% had cortex on them.

Firecracked rock is not especially abundant at this locus, but it increases in abundance toward the west, and is especially prevalent near features.

Historic artifacts were sparse, and consisted mostly of field debris. Most were small fragments of brick or of coal/slag/cinder. Also found were a few nails, several fragments of bottle glass, fragments of window glass, two 22 caliber cartridges, a fragment of a kaolin pipe, and miscellaneous metal bits that might be from farm machinery. All historic materials appear to date to the nineteenth and twentieth centuries.

Features, on the other hand, were abundant. Feature 1, located in the southeast corner of N4W89 was a concentration of fire cracked rock that

probably represents the corner of a rock platform. It measured 27 cm in north-south dimension and 33 cm east-west, and extended into both the south and east walls of the pit. Depth was from 30 to 35 cm and it was associated with bone (including bird bone), nut shells, charcoal, flakes, and two pieces of shell tempered pottery from vessel 59. These artifacts, and the situation of the feature above Feature 2, suggests a Late Woodland age.

Feature 2 is a roughly circular red stained area about 15 cm in diameter and from 36-45 cm in depth. It was located partly in the north wall of N4W89. Dicot charcoal and numerous fragments of dentate stamped sherds from vessel 54 were associated with it, suggesting a Middle Woodland age.

Feature 3 is another fire cracked rock platform located in N6W85 and covering the entire square. The full extent is thus not known. It extends from 25 to 33 cm deep. Charcoal and bone were associated, including bird, large mammal, and turtle shell, as well as nut shells and numerous flakes. No ceramic fragments were found directly in association with this feature, though some were found five cm above it. The ulu, artifact 19, was found just beneath this feature. There was little or soil reddening, as with other rock platforms. Associations suggest a Late Archaic age.

Feature 4 is a post mold, found in the southwest corner of N6W48. It was five cm in diameter and extended from 30 to 40 cm, tapering a bit at the base.

The most unusual feature at this locus was Feature 5, located in N5W55 and N5W56. This was a large, deep pit, about 60 cm in diameter at the top and extending from 30 to 100 cm below the ground surface (Figure 17). In plan view, the top was somewhat elongated toward the west, forming an oval. The soil just above the pit was very hard and compact, as was soil in the upper levels. Soil in the center of the feature was very red, while the outer edge of the feature was very dark and full of charcoal fragments. Soil



Figure 17. Locus D  
Feature 5.  
Earth oven  
cross-  
sectioned  
in east  
wall of  
N5W56.

in the feature became loose, soft, and ashy-pale with depth, and soft, loose sand continued for another 25 cm or so below the base of the feature.

There are three episodes of filling evident in the profile of the feature, and feature contents included much charcoal, including conifer (and Pinus strobus in particular) as well as Castanea, American chestnut. No flakes or bone were found. A few sherds of rocker dentate stamped Vessel 14 were found just at the top of the feature, and this agrees well with the age of

charcoal from the top of the feature, which produced a radiocarbon date of  $1710 \pm 130$  radiocarbon years BP (C 13 corrected, GX-9002), or AD 240. Charcoal fragments were largest at the base of the feature and around the outer rim. A few small areas of charcoal and burned red soil were found just around the edge of the feature at its top. There was evidence of rodent burrowing around the edges of this feature.

I suggest that a very deep pit was dug in the soft sand at this location, and then lined with large planks or logs of wood with their ends pointing toward the center and bottom of the hole. Something, perhaps wrapped food, was then placed in the middle and then the whole feature was covered and allowed to cook. The same facility was used two more times, by which time it was largely filled up and then abandoned. The feature may thus have been some sort of earth oven.

A series of six postmolds extend along the south side of Feature 5 and may or may not be associated with it. They have been called Feature 6. They appeared at the base of the plowzone, 30 cm, but extended only another two to six cm below. They ranged in diameter from four to seven cm, and had rounded bases. They were in a relatively straight line, and were spaced very nearly 30 cm (or one foot) apart. There are three possible explanations for these features, and few convincing reasons to decide between them. First, the postmolds may be associated with Feature 5 and represent the remains of a rack, as was found at the Wheeler's site (Barber 1982). They were not found on the other sides of the feature, however, so this explanation seems less likely. Second, they may have been part of another prehistoric feature such as a longhouse, which just happened to be located near Feature 5. If so, the two features were probably not functioning at the same time, as heat from the oven would surely have ignited any nearby structure. Third, the postmolds may represent a historic fenceline.

This locus had the greatest densities of prehistoric material of any of the loci tested, suggesting regular and heavy use. The absence of fish remains is striking, but may be explained by processes discussed in Chapter 6. Some of the deeper flakes may date to Middle Archaic times, but nothing diagnostic from that period was found. Several of the projectile points and Feature 3 are likely to be Late Archaic in age. They are associated with bones of bird, turtle, and mammals, and with nut shells. The few sherds of Early Woodland pottery may well be strays, which would mean the next major period of occupation was during Middle Woodland times. Numerous vessels and perhaps some of the points date to this period, as do Features 2 and 5. No bone or nuts could be associated with Middle Woodland remains. However, bird bone and nut shells were found in association with early Late Woodland Feature 1. This period also produced the majority of vessels at this locus. Later Late Woodland ceramics were quite localized in the western part of the locus, but not exclusively associated with any other materials. Features 4 and 6 are of unknown age. Their depths suggest they are Woodland age, and the latter may be historic. The very fact that this locus was used by people of many time periods makes it difficult to distinguish any specific activities occurring here.

#### LOCUS E

This locus is undoubtedly the core of the traditional site known as Shattuck Farm. It is a large, level area of about 250,000 square meters (Figures 18 and 19), immediately adjacent to the bend in the Merrimack River. Datum D, at an elevation of 15.8 meters above mean sea level, was used for locus E. Contours on Figure 19 do not extend to the edge of the river. There may also have once been a secondary watercourse in the form of a stream leading out of the marsh at its west end, which appears on some of the older maps of the area. This area is open fields, except for a strip of



Figure 18. Locus E, Site View from South.

oak and pine trees along the edge of the river bank. The fields were under cultivation in 1980, although they were not farmed in 1981. They have probably been farmed almost continuously since the eighteenth century.

This area was mentioned repeatedly by collectors, and indeed is the only part of Shattuck Farm that now has significant quantities of prehistoric materials visible on the ground surface. We left most of this material where it lay, but did collect a few items which are listed on Table 30. The productivity of this area was confirmed by the 1981 survey team, which called this locus the "Butternut Squash site" because this was the crop in that field at the time. However, the survey also confirmed that this area

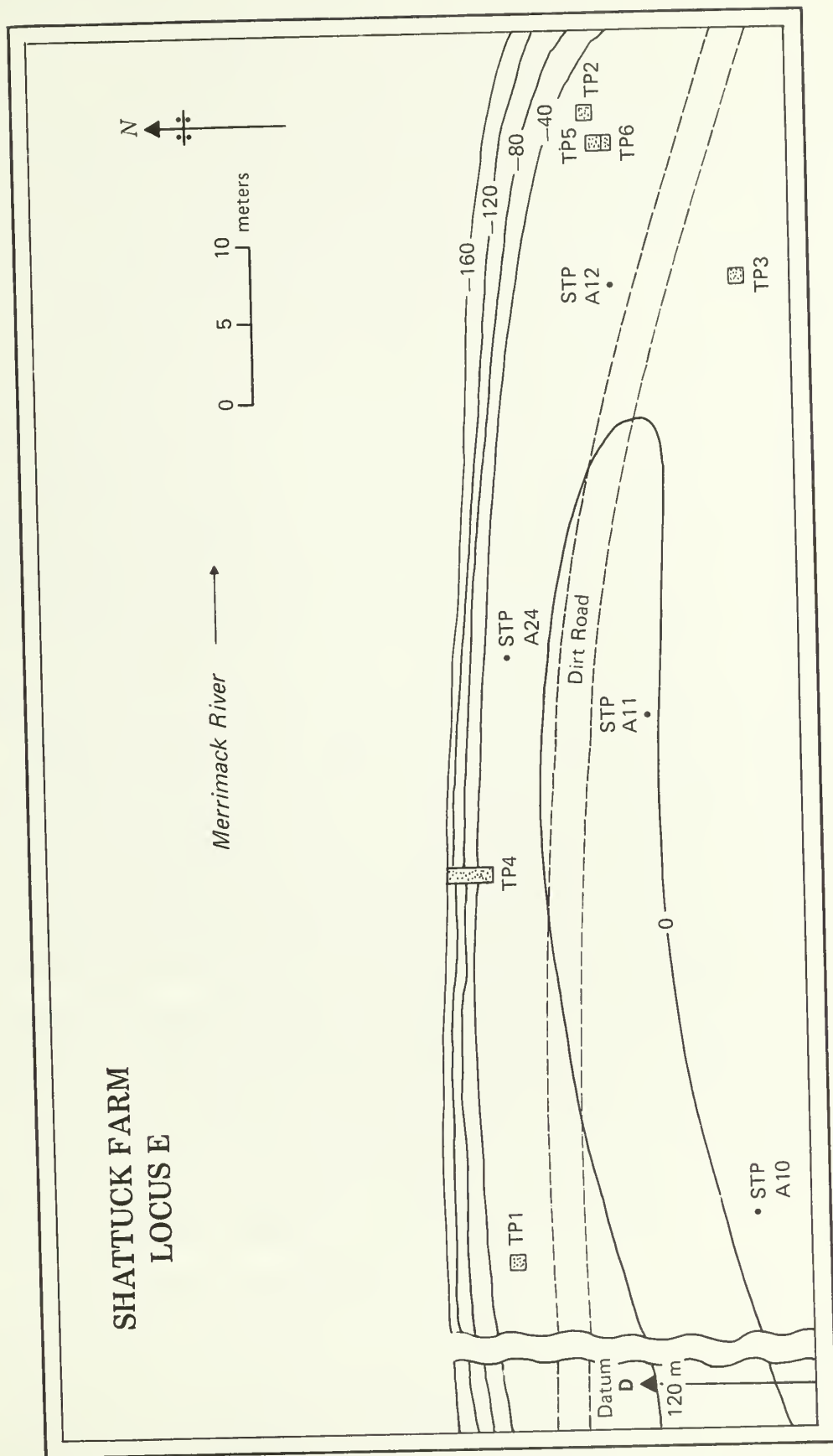


Figure 19. Map of Locus E. Wavy vertical lines = 120 meters not included on map.

was severely disturbed by plowing, by the construction of a sewer line, by road building, and by bulldozing associated with the removal of the kame terrace. Nearly all of the materials recovered in the shovel test pits were from the plow zone, and this assemblage had undoubtedly been depleted by centuries of intense and regular surface collecting, which included sherds and flakes in some cases. Materials were found fairly continuously from the bulldozed areas to the river. Material frequencies were low in the area between loci D and E, and then increased gradually toward the east until they ended rather abruptly at a slight break in slope leading down to the marsh (Mahlstedt 1981:59). There are surely features present throughout this area as well, but it did not appear to us to be worthwhile to excavate a limited number of test pits in such a large area in the hope of encountering a few features.

Therefore, we decided to concentrate our testing efforts at this locus along the edge of the river bank, where we assumed disturbance would be at a minimum. We assumed that farmers would be unable to plow right to the edge of a steep bank, and that they would probably prefer to keep a line of trees there, as now, to protect the bank from erosion. Thus, locus E was the only locus tested nonprobabilistically; we simply laid out five one meter square test pits in areas that did not appear to be disturbed. The use of test pit numbers rather than square coordinates also reflects the different sampling method used on this locus. An additional one meter by .5 meter square, TP 6, was later added to fully expose a feature in TP 5. TP 1 was abandoned after five cm when it was discovered to include a ground bee's nest, and the five fragments of fire cracked rock recovered from that square are not included in the site summary tables. Thus, a total of 4.5 square meters was excavated at this locus, and the artifacts recovered can be considered representative only of this small area near the river. However, the materials

found are in very good agreement with the surface collections from this locus.

Test pits in this locus were also placed so that we could examine the river bank itself and determine its geomorphic history. Test pit 3, located at the edge of the present field, showed east-west plow scars at the base of the plowzone, about 30 cm below ground surface. When this field was in crops in 1981 it had been plowed and planted in rows that ran from east to west. There were no plow scars in the testpits closer to the river, but TP 5 did produce a fragment of firecracked rock with what looks suspiciously like a plow gouge from level 3, 10-15 cm. It is true that the riverbank underwent considerable erosion in the early 1800s, as suggested in Chapter 3, then it is likely that what is now the riverbank was at that time far enough back from the river to have been plowed.

As an additional means of examining the riverbank itself, TP 4 was extended to the north so that it dropped down the slope to the river, like a staircase, with a total drop of 1.35 meters and a length of three meters. The sidewalls reveal soil levels parallel to the sloping ground surface (Figure 20) and the existence of an A1 horizon among these strata suggested to McDowell that the riverbank at this spot has been stable for at least the last 40 years. Test pits 2, 4, and 5 also show thin lenses of soils of slightly different colors and textures in their upper levels, and these may relate to flood or wind deposits from the last 100 years or so. It should be noted here that test pit 4 also provides evidence for slopewash; all artifacts found below 35 cm in this square were found in the extension down the slope leading to the river, and were redeposited.

The soils at this locus are very fine and free of pebbles. For all but test pit 3, the first 35 cm were fine silty sandy brown (10YR 3/4) loam, with light brown (10YR 4/3) sandy loam below it from 35 to 50 cm. From 50 to 70 cm were yellow-orange (10YR 5/6) sands, underlain by fine greyish white

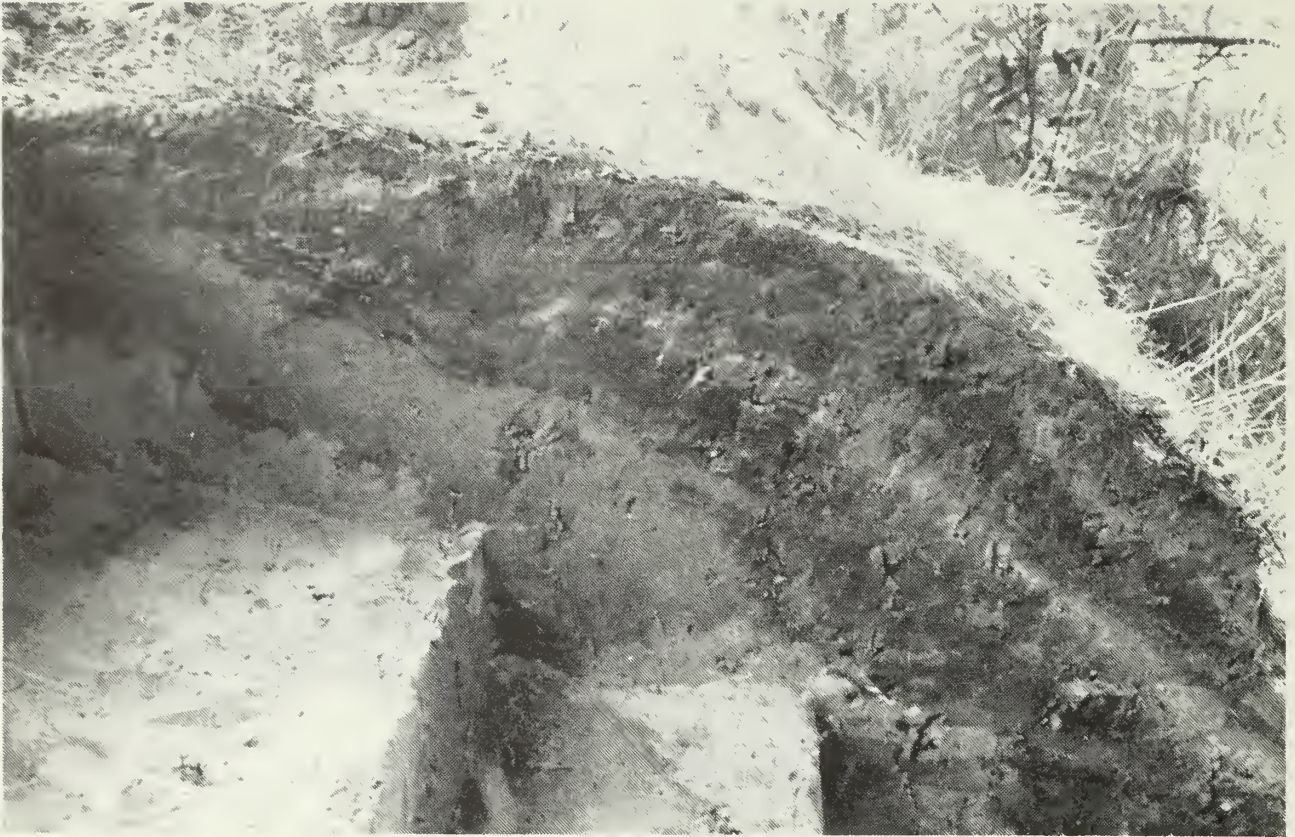


Figure 20. Locus E, Soil Profile. West wall of TP 4, stepping down toward the Merrimack River.

sands (10YR 7/3). There was only minor evidence of rodent disturbance at this locus.

Tables 28 through 33 show the finds from locus E. Bone remains are unusually well represented, for reasons that are not entirely clear. Remains include 124 turtle shell fragments (8.35 gm), 35 fragments of sturgeon scute (4.05 gm), 13 fragments of bird bone (1.55 gm), 466 small fish vertebrae (3.0 gm), six fragments of fish head parts (.55 gm), two muskrat bones (.9 gm), one mouse bone (.05 gm), 15 snake vertebrae (1.4 gm), and 2202 fragments of unidentifiable bone (40.0 gm). The small fish vertebrae are obviously of considerable interest, and we would have liked to identify them more specifically.

Table 28. Locus E Excavated Materials: Total Sample (N=4.5m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0	1 .2	2 1.5	#13	23 24.1	66 1051	3 7.1	
5	1 .6	13 3.4	#14	49 30.6	51 811	2 .8	
10	41 3.6	31 16.4	#1, 6, 10	83 94.1	137 2412	1 .3	
15	86 3.8	50 29.2	#11, 17	98 75.8	54 760	1 1.8	
20	378 8.7	34 17.6	#4, 7, 8, 20, 23, 24	227 148.4	181 3156		F2
25	406 10.2	9 4.6	#2, 3, 5, 18	83 91.6	73 1673		
30	550 10.0	5 1.2	#16, 19, 21	39 55.8	54 755		F1
35	554 7.6	5 2.8		25 26.0	53 864		
40	355 7.5	4 1.6	#12, 25	19 30.3	17 186		
45	205 2.4	1 .4	#9	15 6.3	18 397		
50	142 2.6	3 1.3	#22	8 5.8	20 203		
55	69 1.2	1 .3		8 4.8	9 53		
60	55 .7			4 4.3	14 47		F3
65	96 1.0	4 1.6	#15	27 17.8	80 583	26 7.8	
Below							
65							
T	2939 60.2	162 81.8	25	708 615.8	831 12977	33 17.8	87cm

Table 29. Locus E Ceramics (Total Sample)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#1	TP 4 5-35 cm	19	7.35	shell	medium brown	.5-.7	smooth	smoothed cordmarking	flat	coil breaks
#2	TP 4 5-35 cm	5	1.8	fine grit	dark brown	.5-.55	smooth	smoothed cordmarking	---	---
#3	TP 4 10-35 cm	4	1.2	medium grit	brown	.5	smooth	cordmarked	---	---
#4	TP 4 in slope- wash	1	1.3	fine shell	dark brown	.45	smooth	cordmarked	---	---
#5	TP 4 in slope- wash	1	.8	fine grit	grey	.4	smooth	fine cordmarking	---	---
#6	TP 3 0-25 cm	4	2.7	medium grit	sandy brown	.7	smooth	smoothed		
#7	TP 3 10-30 cm	3	.6	shell	brown	.7-.75	smooth	smooth	---	---
#8	TP 3 15-20 cm	1	.3	fine grit	black	.4	smooth	smoothed cordmarking	---	---
#9	TP 3 25-30 cm	1	.9	shell	brown	.8	smooth	cordmarked	---	---
#10	TP 2, 5 0-35 cm	12	5.2	medium grit	medium brown	.6-.75	smooth	dentate stamped	---	---

Table 29. Locus E Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#11	TP 2 10-15 cm	1	1.0	fine grit	black	.3	smooth	smoothed cordmarking	—	—
#12	TP 2, 5 10-45 cm	42	15.85	shell	grey	.5-.85	smooth	light incising	—	—
#13	TP 2, 5 10-15 cm	2	.7	medium grit	sandy, reddish	>.5	smooth	cordmarked	—	—
#14	TP 2, 5, 6 15-30 cm	5	6.15	fine grit	black	.35-.4	smooth	smoothed cordmarking	—	—
#15	TP 2, 5 15-40 cm	44	14.25	shell	brownish grey	.5-.75	smooth	cordmarked	—	—
#16	TP 2 15-25 cm	9	4.8	medium grit	tan to grey	.65-.75	smooth	dentate rocked stamped	—	—
#17	TP 2, 6 15-25 cm	3	4.6	medium grit	medium brown	.75-.8	smooth	smoothed	—	coil break
#18	TP 5, 6 5-20 cm	12	3.6	shell	brown	.8	smooth	fine cordmarking	—	—
#19	TP 5, 6 5-25 cm	4	8.1	medium grit	medium brown	.55-.7	smooth	square dentate stamps perpendicular to rim	flat, stamped with same tool	mouth diameter 20 cm?
#20	TP 6 10-15 cm	1	2.2	fine shell	dark brown	.6	smooth	incised	—	body diameter 15 cm?

Table 30. Locus E Lithic Artifacts (Total Sample)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
1 (207/2519)	TP 5	black felsite	3.6	1.7	.9	5.7	side notched projectile point with tip broken (Figure 30k)
2 (207/2541)	TP 5	grey felsite	3.0	1.4	.6	2.2	small stemmed point (Figure 30l)
3 (207/2118)	TP 2	grey felsite	2.6	1.3	.7	1.7	small stemmed point (Figure 30m)
4 (207/2112)	TP 2	grey quartz	2.0	1.6	.9	3.7	biface fragment - stem of projectile point?
5 (207/2369)	TP 4	grey quartz	4.5	2.2	1.1	10.5	irregular biface (Figure 29g)
6 (207/2520)	TP 5	white quartz	2.2	1.2	.7	2.1	broken biface - drill base?
7 (207/2532)	TP 5	white quartz	2.7	2.4	1.5	10.3	biface fragment
8 (207/2533)	TP 5	grey quartz	3.2	2.3	1.2	8.5	pointed oval biface (Figure 29h)
9 (207/2683)	TP 6	white quartz	3.2	2.7	1.3	9.2	utilized flake-scraper
10 (207/2060)	TP 3	grey argillite	7.7	3.6	3.1	134.4	pestle fragment (Figure 31b)
11 (207/2528)	TP 5	grey slate	2.6	1.9	.45	4.7	fragment of ground slate

Table 30. Locus E Lithic Artifacts (Total Sample) (Continued)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
12 (207/2591)	TP 5	grey-green diorite	2.3	1.3	.3	1.0	flake from edge of ground stone tool
13 (207/2051)	TP 3	grey quartz	5.7	4.1	2.2	57.7	pebble hammerstone
14 (207/2053)	TP 3	purple-grey felsite	5.9	3.9	3.4	70.0	broken hammerstone
15 (207/2443)	TP 4	purple felsite	5.2	4.7	2.2	59.0	broken hammerstone
16 (207/2124)	TP 2	white quartz	3.9	3.2	2.2	28.6	core
17 (207/2065)	TP 3	grey quartz	3.8	2.5	2.2	28.2	core
18 (207/2370)	TP 4	white quartz	2.9	2.0	1.0	6.1	core
19 (207/2374)	TP 4	grey quartz	3.3	2.3	1.2	9.0	core
20 (207/2531)	TP 5	grey felsite	4.6	2.7	1.4	23.8	core
21 (207/2566)	TP 5	grey quartz	3.6	2.4	2.0	20.6	core
22 (207/2604)	TP 5	grey quartz	2.7	2.0	1.6	7.1	core

Table 30. Locus E Lithic Artifacts (Total Sample) (Continued)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
23 (207/2666)	TP 6	white quartz	4.0	1.7	1.3	7.9	core
24 (207/2666)	TP 6	grey quartz	5.1	2.5	2.2	22.9	core
25 (207/2680)	TP 6	white quartz	3.4	2.4	1.6	14.5	core
26 (207/2495)	surface	white quartz	2.0	1.3	.7	1.6	triangular projectile point
27 (207/2494)	surface	black felsite	2.5	1.8	.5	2.1	triangular projectile point
28 (207/2506)	surface	grey-green felsite	4.2	6.0	.9	32.2	large oval biface, broken
29 (207/2505)	surface	white quartz	4.8	3.8	2.4	38.7	core scraper
30 (207/2505)	surface	grey-white quartz	3.8	2.6	1.0	11.5	core
31 (207/2505)	surface	white quartz	3.7	2.6	.9	11.2	core
32 (207/2505)	surface	white to clear quartz	4.0	2.7	1.7	22.0	core
33 (207/2505)	surface	yellowish quartz	5.2	4.6	2.8	71.1	core

Table 31. Locus E Flake Numbers and Weights (Total Sample)

Depth	Quartz #	Quartz gms	Grey Felsite #	Grey Felsite gms	Black Felsite #	Black Felsite gms	Purple Felsite #	Purple Felsite gms	Pink Felsite #	Pink Felsite gms	Quartzite #	Quartzite gms	Argillite #	Argillite gms	Grey Chert #	Grey Chert gms	Brown Chert #	Brown Chert gms	Total #	Total gms
0	15	13.3	7	10.4			1	.4											23	24.1
5																				
10	33	18.8	12	6.4	1	1.9	1	2.6	1	.3					1	.5			49	30.6
15	58	79.4	24	8.9							1	5.8							83	94.1
20	64	63.0	30	8.4			2	2.0	1	1.8							1	.6	98	75.8
25	160	123.8	62	20.0	1	.5	1	.5			2	3.5	1	.2					227	148.4
30	65	81.5	16	9.2					2	.9									83	91.6
35	33	53.4	5	2.1					1	.4									39	55.8
40	21	24.2	4	1.8															25	26.0
45	19	30.3																	19	30.3
55	19	10.5	4	1.6															23	12.1
65	10	7.2	2	1.9											1	.2			13	9.3
Below	17	13.5	10	4.1															27	17.6
T	514	518.8	176	74.8	2	2.4	5	5.5	5	3.4	3	9.3	1	.2	2	.7	1	.6	708	615.8

Table 32. Locus E Flake Percentages (Total Sample)

Depth	Quartz #	Quartz gms	Grey Felsite #	Grey Felsite gms	Black Felsite #	Black Felsite gms	Purple Felsite #	Purple Felsite gms	Pink Felsite #	Pink Felsite gms	Quartzite #	Quartzite gms	Argillite #	Argillite gms	Grey Chert #	Grey Chert gms	Brown Chert #	Brown Chert gms
0																		
5	65.2	55.2	30.4	43.2			4.3	1.6										
10	67.3	61.7	24.5	20.9	2.0	6.2	2.0	8.5	2.0	1.0					2.0	1.6		
15	69.9	84.4	28.9	9.4							1.2	6.2						
20	65.3	83.2	30.6	11.0			2.0	2.6	1.0	2.4							1.0	.8
25	70.5	83.4	27.3	13.5	.4	.3	.4	.3			.9	2.4	.4	.1				
30	78.3	89.0	19.3	10.0					2.4	1.0								
35	84.6	95.5	12.8	3.8					2.6	.7								
40	84.0	93.1	16.0	6.9														
45	100.0																	
55	82.6	86.8	17.4	13.2														
65	76.9	77.4	15.4	20.4											7.7	2.2		
Below	63.0	76.7	37.0	23.3														
T	72.6	84.2	24.8	12.1	.3	.4	.7	.9	.7	.6	.4	1.5	.1	.03	.3	.1	.1	.1

Table 33. Locus E Fire Cracked Rock (Total Sample)

FCR	Merrimack Quartzite	Granite	Other Quartzite	Quartz	Diorite	Felsite	Total
Number	728.0	56.0	27.0	13.0	6.0	1.0	831.0
% by Number	87.6	6.7	3.2	1.6	.7	.1	99.9
Weight in Grams	10624.0	1451.0	378.0	328.0	188.0	8.0	12977.0
% by Weight	81.9	11.2	2.9	2.5	1.4	.06	100.0

However, the expert we consulted said they might be herring, American eel, or even immature shad, and he was unwilling to guess which (Karsten Hartel, Museum of Comparative Zoology, Harvard University, personal communication).

Bone remains were most abundant in test pit 5, which produced 2419 fragments. The next most productive square, test pit 2, only produced 155 bone fragments. Part of the density in test pit 5 is due to the use of window screening and flotation there, but these measures were instituted precisely because we could see large quantities of bone in the soil. Unusual preservation is also part of the explanation; test pit 3 was screened only with the usual 1/4 inch screen, and still produced 32 bone fragments, well above average for Shattuck Farm. These soils close to the river are clearly less acid than those elsewhere at the site. This may be the result of some factor associated with flooding, or perhaps large quantities of bone were simply deposited in this area during the prehistoric period, thus altering the soil chemistry so that more of the calcined fragments were preserved. The unusually good preservation of organic materials in a pit feature excavated by Walter Vossburg (Appendix I) is further evidence of the unique conditions at this locus.

Vertical differences in the distribution of bone were also evident.

Turtle shell fragments and unidentifiable bone fragments were found throughout the sequence, but sturgeon scutes and small fish vertebrae were found primarily in the upper levels. Bird, snake, and fish mouth parts were found predominately in the lower levels of the locus, without ceramic associations. The lower levels of test pit 5 also produced the majority of the nut shells found. Most of these latter are hickory, but one carbonized acorn shell and some possible black walnut shells were also found. The upper levels of test pits 2 and 3 also produced a few hickory nut shells.

Ceramics were reasonably abundant, with higher frequencies in the squares closest to the river. They include the remains of five fine grit tempered vessels, eight shell tempered vessels, and seven medium grit tempered vessels, and are predominately Late Woodland in age. There were no detectable differences in the horizontal distribution of vessel types, though this is not surprising given the relatively close spacing of the test pits. There was also no obvious vertical zoning of types, and this is further evidence that the area has been plowed or disturbed at some time.

Locus E produced a considerable number of lithic artifacts, given the small area excavated. Unfortunately, most of these artifacts were from the upper levels, which appear to contain a mix of ceramic and preceramic artifacts. Thus, all three of the projectile points were found in levels that also produced ceramics. These include artifacts 2 and 3, both small stemmed points with heavy wear on what is assumed to be their stems (Figure 30 l, m). Stems were 1.1 cm and 1.5 cm in length, respectively. Artifact 1, also found in these levels, is a side notched point with its tip broken off (Figure 30k). Stem length for this point is 1.0 cm, stem width is 1.5 cm, and stem thickness is .6 cm. This point fits the size range and description for Brewerton notched points (Ritchie 1971), and shows no obvious wear.

All five of the bifaces and biface fragments from this locus were also found in the upper levels. Artifacts 4, 6, and 7 are all apparently stem fragments, perhaps from projectile points or drills, and all show no wear. Artifacts 5 and 8 are both elongated ovals which may have been used as knives, or which may have been preforms (Figure 29g, h). No wear was visible on either of these bifaces.

Artifact 10 is a fragment of the top of a pestle (Figure 31 b). The very top has been damaged by the removal of three flakes, but appears to be expanding as if the pestle had originally been knobbed. Artifact 11 is a rectangle of ground slate, smoothed on both faces and rounded and ground on one edge. The other three edges are all broken, and it is thus impossible to tell whether this is a fragment of an ulu, of a gorget, or of some other item. One side bears scratches that may have been part of a design, however. Artifacts 13 and 14 are hammerstones made from rounded river cobbles, and the latter is broken. Artifacts 17, 18, 20, 22, 23, and 24 are all quartz cores, and none show signs of wear. All of the above artifacts were found in the upper levels of the locus, associated with ceramics. Again, it is assumed these are mixed levels.

Materials found in the lower ceramic levels include no diagnostic artifacts. Artifact 9 is a flake that has been utilized as a scraper. Artifact 12 is a flake removed from the edge of a ground stone tool, with striations running parallel to the length of the flake. Artifact 15 is a broken hammerstone, and artifacts 16, 19, 21, 24, and 25 are cores.

Finally, one fragment of worked graphite was found in the lower part of the ceramic level of test pit 5. It is about one cm long, scratched and worn, and weighs .2 gm.

Additional surface finds from this locus include four cores, one core scraper, a large carefully flaked oval biface which has been broken, and two

projectile points. The first of these latter, artifact 26, is a concave based triangular point of quartz that fits within the size range for a Squibnocket triangle and has visible wear on all edges, including the base. The second point, artifact 27, is a felsite triangular point with a straight base. It fits within the size ranges for Madison or Jack's Reef pentagonal points, and shows no wear.

Flakes were abundant in these squares, with frequencies increasing to the east. Most of the debitage is quartz and grey felsite, with the former material slightly more abundant in lower levels. All material types show similar patterns of many larger flakes and relatively few very tiny flakes. Proportions for quartz are 4.7% big flakes, 16.4% medium flakes, 65.3% small flakes, and 13.6% tiny flakes, with cortex on 4.5% of all flakes. Grey felsite flakes were 1.2% big, 12.1% medium, 61.3% small, and 25.4% tiny, with 4% showing cortex remnants. Other materials showed a pattern of 12% big, 36% medium, 44% small, and 8% tiny flakes, with 16% showing cortex.

Fire cracked rock was relatively abundant, evenly distributed, and otherwise unremarkable.

Historic artifacts represent normal field debris, and include primarily fragments of rusty metal and of cinder/slag/coal. We also recovered a few fragments of brick, several glass jar fragments, and a 22 caliber slug. The levels of test pit 4 which sloped down toward the river produced picnic remains such as a pop-top ring and bits of styrofoam cups.

Features included a postmold located along the south wall of test pit 3. This postmold, Feature 1, was seven cm in diameter at the top and tapered to a point. It was first recognized at 34 cm and extended to 49 cm below ground surface. The post had been inserted at an angle, and the top of the post would have pointed toward the north. This postmold is very similar to those found at the Middle Woodland Locus G.

Feature 2 is a small scatter of fire cracked rock, about 33 cm long from north to south and 16 cm wide, located in test pit 5 and part of test pit 6. It lay from 20 to 25 cm in depth, and the rocks did not appear to have been packed in place as were those in rock platforms. The soil was not reddened. However, these rocks were associated with numerous fragments of charred wood and with bone fragments including sturgeon, turtle, small fish vertebrae, and unidentifiable fragments. It is here assumed that this feature dates to the ceramic period, due to its relatively shallow depth.

Feature 3 was located in the southwest corner of test pit 5, and was a trash pit. It began at 63 cm and extended to 87 cm, and was shaped like a deep basin or kettle. It was 25 cm in length and 15 in width, oriented with its long axis from east to west. It contained numerous charcoal fragments, many of them from conifer woods, as well as a quartz flake and small bone fragments including fish vertebrae. From its depth, it is assumed to date to the Late Archaic or earlier.

Because this area was heavily and regularly used by prehistoric people, and then probably plowed in historic times, the picture of prehistoric life is somewhat more blurred here than at many of the other loci. The lack of vertical stratification was especially disappointing. Occupations for which diagnostic materials were obtained include Late Archaic, Middle Woodland, and both early and late Late Woodland. Other periods cannot be ruled out. Assumed to date to the Late Archaic are Feature 3, a trash pit, as well as the quantities of nuts, snake bones, bird bones, and some fish remains. Several of the ceramic vessels date to the Middle Woodland, and Feature 1 is also tentatively assigned to this period. The Late Woodland is represented by shell and fine grit tempered ceramics and probably by most of the sturgeon bone fragments. Again, though, it must be stressed that these samples represent only the riverside periphery of an area that has been heavily surface collected and which was

also heavily used by prehistoric people. There could be significant bias in these findings because of these various factors.

It is interesting to note that this tested area, close to the western edge of the marsh, was the only part of Shattuck Farm to produce remains of small fish such as are likely to be trapped in backwater sloughs. Limp and Reidhead (1979) have commented on the extraordinary food potential of such situations.

#### LOCUS G

Locus G is an area of about 1000 square meters located just south of the marsh at the east end of the Shattuck Farm site (Figures 21 and 22). Distance from the edge of the locus to the Merrimack is 110 meters, and it is adjacent to secondary fresh water sources in the marsh. Elevation of Datum G is 15.5 meters above mean sea level. The area today is covered by trees, including birch, pine, and oak, with fairly heavy weedy undergrowth as well. The locus is very sheltered, and was the most comfortable locus at Shattuck Farm in both hot and cold weather. However, this may be a function of the present vegetation, rather than the topography of this locus. The area is sheltered from the south by the edge of the kame terrace, but there is no real shelter from the west, north, or east.

Locus G was discovered during the survey, and no collectors reported finding prehistoric materials here. Fire cracked rock, flakes, sherds, and a fragment of a triangular biface were found in test pits during the survey, and the survey report also mentions discovery of a possible feature (Mahlstedt 1981). This anomaly was fully exposed during the 1981 season, and found to be only a buried plow zone. We excavated a random sample of eight one meter squares at this locus, and nine additional nonrandom squares. One of these latter was a sterile pit immediately adjacent to the marsh, excavated primarily to



Figure 21. Locus G, Shattuck Pond from the West. Locus in immediate foreground.

check the stratigraphy, and this pit is not included in the pit totals and averages. The other eight nonrandom squares were excavated in order to expose a fairly large area which had produced features; two of these squares were 1 x .5 meters in size, so the total area excavated for this locus comes to 15 square meters. Two test pits and a number of shovel test pits were also excavated to the west of this locus, and these results will be discussed later in this chapter.

The heavy vegetation on this locus indicates that it has not been under cultivation for some time, but east/west plow scars in most test pits are proof that it was a plowed field at one time. This is the one area of the

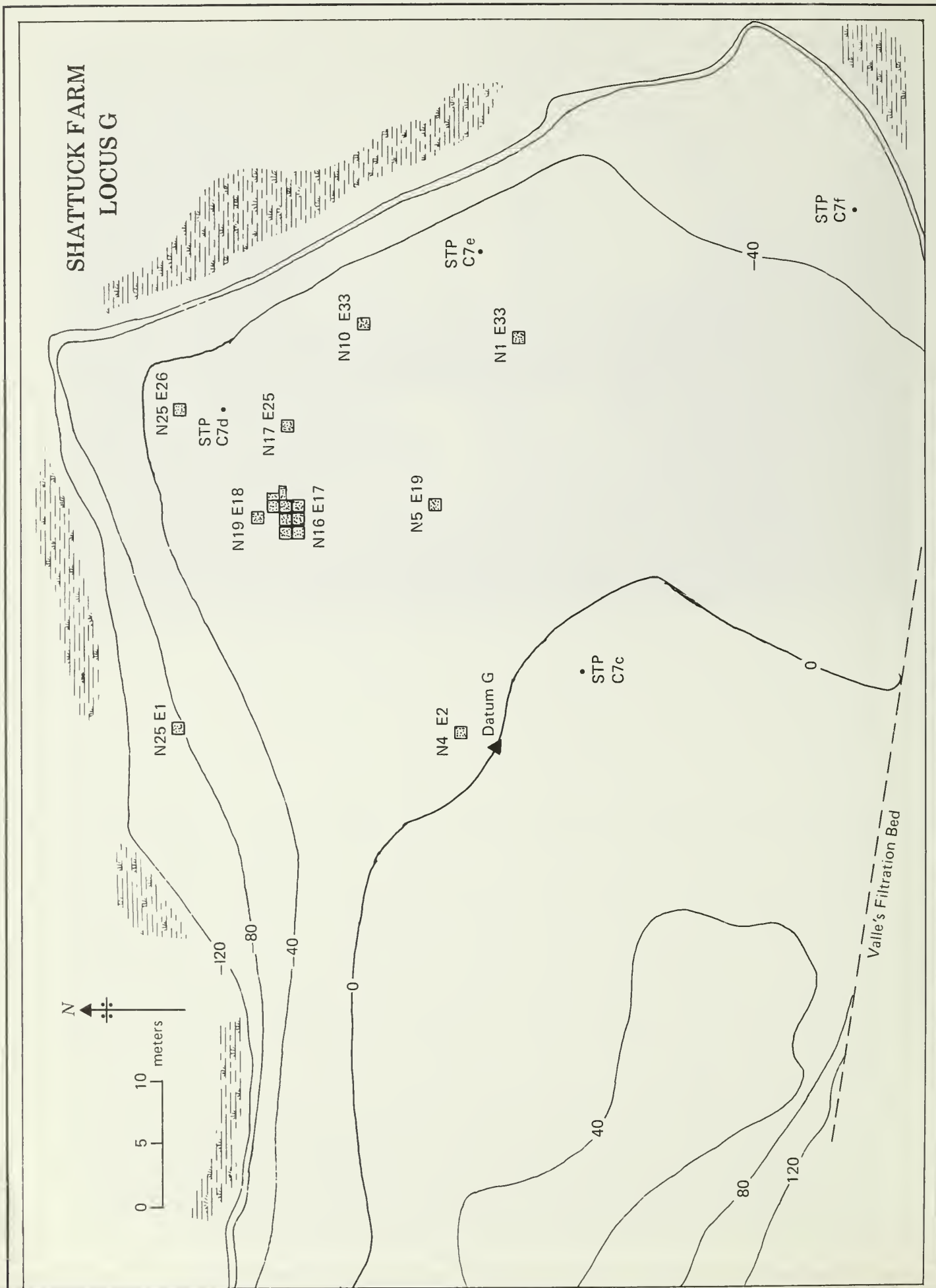


Figure 22. Map of Locus G.



Figure 23. Locus G, Typical Soil Profile. North wall of N16E18.

Shattuck Farm site where we found clear evidence of flooding, in the form of a thick deposit of waterlaid grey sand, swirled and laminated by the flood currents (Figure 23). This deposit overlies a buried plow zone, and thins markedly to the west and south. The flood deposit is essentially sterile and overlies historic artifacts, so is not very old and is likely to represent a single episode of severe flooding. The historic artifacts and approximate age of the trees would not be inconsistent with the hypothesis that this flood deposit was left by the last major flood in this area, that of 1936. This flood deposit was shoveled out as a single level in all squares after careful excavation and screening of the first two squares indicated that the deposit

was sterile. The presence of this deposit accounts for the unusual depths of artifacts at this locus.

The stratigraphy for this locus includes dark brown (10YR 2/2) sandy topsoil with roots and leaves for the top five centimeters. From 5 to 20 cm is fine grey (10YR 5/2) sand with thin swirls and laminae of darker organic material. From 20 to 35 cm the locus has heavy black (10YR 2/1) clay soil mottled with rust. From 35 to 50 cm is yellow to orange (10YR 5/8) clay soil, which becomes sandier and paler with depth. No rocks or pebbles were found in any of these levels. Little evidence for rodent activity was found at this locus.

Tables 34 through 40 show the artifacts from this locus. Bone remains included 20 fragments of turtle shell (1.35 gm), 16 fragments of sturgeon scute (1.9 gm), four fragments of mammal bone (.6 gm), and 62 unidentifiable bone fragments (3.56 gm), as well as four fragments of bivalve shell that may be soft shell clam (.2 gm). Both hardwood and conifer charcoal were recovered during excavation, but flotation of feature and soil samples produced no nuts or seeds.

Ceramics include sherds from nine vessels, seven of which are grit tempered, and most of which are Middle Woodland in age. Vessel 1 has Late Woodland form and decoration, and vessels 5 and 6 are also probably of Late Woodland age. Vessel 3 is represented by only two tiny sherds, and may possibly be Early Woodland in age. Most of the sherds found at this locus come from two vessels, and there are enough sherds available to describe these vessels in considerable detail. Study of the vertical and horizontal distribution of these sherds suggests that vessel 8 was broken first, somewhere in the northeastern portion of the central excavation block, while vessel 7 was broken later in the southwest corner of the block. Sherds from both vessels overlap through most of this central block, though only sherds

Table 34. Locus G Excavated Materials: Total Sample (N=15m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0						2 .9	
10						7 31.5	
15	1 .1	2 .4					
20	5 .4	48 21.3	#5, 15, 29, 30, 31	65 44.9	7 117	29 42.1	
25	11 .7	207 96.0	#2, 10, 25	110 96.4	19 253	58 116.3	
30	39 2.2	389 211.3	#1, 6, 7, 8, 12, 21, 22, 23	354 309.4	27 919	159 250.5	
35	31 3.0	169 109.8	#11, 13, 14, 16, 17, 28	230 247.4	36 1629	6 4.5	F1
40	12 .9	34 56.6	#9, 18, 19, 20 24, 26, 27, 32	99 145.1	34 1309		F2 F4
45	2 .1	31 19.2	#4, 33	133 150.0	33 1076		F3
50	5 .3	8 6.3		23 12.5	3 19		
55				7 4.8	6 13		
60		1 .1		2 1.6	1 2		
T	106 7.6	889 521.1	33	1003 1012.0	166 5337	261 445.8	88 cm

\* = small postmolds

\*\* = large postmolds

Table 35. Locus G Excavated Materials: Random Sample (N=8m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0						1 .4	
10						7 31.5	
15							
20		1 1.0	#5	4 2.9	3 31	20 40.3	
25	1 .01	16 11.2	#10	37 16.9	3 10	35 50.0	
30	20 1.2	43 28.2	#12, 22, 23	52 28.7	9 103	52 153.9	
35	7 .6	62 42.1	#16, 17, 32	77 44.9	14 1036	6 4.5	Fl
40	8 .7	23 24.2	#9, 18, 19 24, 32	23 23.5	17 275		
45	1 .01	1 5.0	#4, 33	18 24.0	16 823		
50	2 .2	1 2.3		8 4.7	4 47		
55				5 3.6	2 3		
60					1 2		
T	39 2.9	147 114.0	15	224 149.2	69 2330	121 280.6	

Table 36. Locus G Ceramics (Total Sample)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#1	N10E33 10-20 cm	1	1.0	fine grit	yellowish- black	.75	smooth, diagonal lines incised at lip	incised lines perpend- icular to rim	flat, collar sloped toward outside	coil breaks, collared
#2	N10E33 30-35 cm	2	2.0	medium grit	reddish, sandy	>.66	smooth	dentate stamping	—	—
#3	N25E26 35-50 cm	2	2.5	medium to coarse grit	light brown to reddish	.80	cordmarked ?	cordmarked	—	—
#4	N17E25 35-45 cm	4	.8	medium grit	brown	>.4	—	dentate stamped	flat	—
#5	N17E25 35-40	2	.4	shell	yellowish	>.4	—	—	—	—
#6	N16E17 18-40 cm	3	1.0	shell	reddish	>.4	—	—	—	—
#7	central block, 18-40 cm	479	312.0	medium grit	sandy brown, reddish	.5-.95	smooth	dentate stamped	rounded to beveled	coil breaks
#8	central block, 20-45 cm	467	193.2	medium grit	yellowish brown	.6-1.15	smooth	crosshatched incising at rim, rocker dentate stamp- ing below	rounded to flat	—
#9	N16E18 N16E19 35-45 cm	3	12.3	medium grit	sandy, reddish	.6-1.25	smooth	smooth	thickened, flat with 2 impressed lines across rim	—

Table 37. Locus G Lithic Artifacts (Total Sample)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
1 (207/1814)	N17E18	light grey felsite	2.1	1.5	.5	1.5	triangular projectile point with tiny side notches (Figure 30n)
2 (207/2027)	N17E19	grey-green rhyolite	1.7	1.8	.4	1.0	corner of triangular projectile point
4 (207/1032)	N25E26	black chert	1.7	1.4	.4	1.2	stem of broken biface
5 (207/1248)	N10E33	grey felsite	1.3	1.0	.3	.5	corner of triangular projectile point
6 (207/1882)	N17E17	purple felsite	1.3	.7	.5	.4	quadrilateral straight drill (Figure 30o)
7 (207/1983)	N16E17	grey vitreous quartz	3.4	2.9	1.3	14.4	thumbnail scraper (Figure 29i)
8 (207/1828)	N17E18	grey felsite	2.6	1.6	.6	2.7	utilized flake-scraper
9 (207/1103)	N17E25	grey quartz	3.0	2.8	1.6	11.6	utilized core-scraper
10 (207/992)	N5E19	grey granite	10.2	8.2	6.4	760.0	hammerstone
11 (207/2184)	N16E17	Merrimack quartzite	11.2	7.3	3.8	521.0	hammerstone
12 (207/1404)	N16E17	yellowish granite	14.8	11.3	8.7	2105.0	hammerstone
13 (207/1904)	N17E17	Merrimack quartzite	10.1	8.2	4.4	482.0	hammerstone

Table 37. Locus G Lithic Artifacts (Total Sample) (Continued)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
14 (207/1819)	N17E18	Merrimack quartzite	8.4	5.7	4.5	330.0	hammerstone (Figure 31d)
15 (207/2451)	N17E20	brown basalt	4.7	3.9	2.4	55.3	hammerstone
16 (207/1085)	N17E25	grey quartz	5.7	4.2	3.6	110.6	hammerstone (Figure 31e)
17 (207/1086)	N17E25	brown siltstone	4.5	3.4	2.0	42.3	hammerstone
18 (207/1090)	N17E25	yellowish granite	4.4	3.3	2.9	55.4	hammerstone
19 (207/1091)	N17E25	dark grey quartzite	6.4	4.4	4.0	157.2	hammerstone
20 (207/1959)	N18E19	fine granite	11.2	6.9	4.5	421.0	broken hammerstone
21 (207/1984)	N16E17	red quartz	7.0	6.8	4.8	185.1	core
22 (207/1400)	N16E18	white quartz	4.1	3.6	1.7	28.5	core, utilized as hammerstone
23 (207/1400)	N16E18	white quartz	3.4	3.0	2.0	22.9	core
24 (207/1413)	N16E18	pink vein quartz	5.2	3.6	2.6	48.5	core
25 (207/1881)	N17E17	yellow-green quartz	4.3	4.3	1.7	49.2	core

Table 37. Locus G Lithic Artifacts (Total Sample) (Continued)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
26 (207/1893)	N17E17	grey quartz	4.7	4.5	2.2	59.9	core
27 (207/1893)	N17E17	yellowish-grey quartz	6.5	4.2	2.7	64.0	core, possibly utilized as knife
28 (207/1820)	N17E18	grey quartz	5.4	4.4	3.0	92.7	core, utilized as hammerstone
29 (207/2450)	N17E20	yellow quartz	5.4	3.7	1.3	38.3	core
30 (207/2450)	N17E20	grey quartz	3.7	2.5	1.7	12.7	core
31 (207/2450)	N17E20	pink quartz	2.7	2.9	1.0	6.6	core, utilized as spokeshave
32 (207/1093)	N17E25	grey quartz	2.9	2.4	2.2	19.2	core
33 (207/1022)	N25E26	white quartz	8.7	5.9	2.4	125.8	core, utilized as scraper

Table 38. Locus G Flake Numbers and Weights (Total Sample)

Depth	Quartz #	Grey Felsite #	Black Felsite #	Purple Felsite #	Tan Felsite #	Grey Rhyolite #	Argillite #	Quartzite #	Saugus Rhyolite #	Total #	gms
0											
10											
15											
20	7	39	1				18			65	44.9
25	37	54		5			12	2		110	96.4
30	107	206		2		1	38			354	309.4
35	122	101		1			6			230	247.4
40	50	36		4	1		6	1	.9	99	145.1
45	84	20		7			2			113	150.0
50	12	9					2			23	12.5
55	6	1								7	4.8
60	2	466								2	1.6
T	427	466	1	19	1	1	84	3	.9	1003	1012.0

Table 39. Locus G Flake Percentages (Total Sample)

Depth	Quartz # gms	Grey Felsite # gms	Black Felsite # gms	Purple Felsite # gms	Tan Felsite # gms	Grey Rhyolite # gms	Argillite # gms	Quartzite # gms	Saugus Rhyolite # gms
0									
10									
15									
20	10.8 18.7	60.0 49.2	1.5 3.1				27.7 29.0		
25	33.6 52.7	49.1 22.2		4.5 1.2			10.9 11.7	1.8 12.1	
30	30.2 59.9	58.2 33.4		.6 .2		.3 .4	10.7 6.2		
35	53.0 83.9	43.9 14.5		.4 .1			2.6 1.5		
40	50.5 76.3	36.4 11.0		4.0 .9	1.0 .1		6.1 2.0	1.0 9.1	1.0 .6
45	74.3 94.7	17.7 4.2		6.2 .7			1.8 .4		
50	52.2 53.6	39.1 40.0					8.7 6.4		
55	85.7 91.5	14.3 8.4							
60	100.0								
T	42.6 70.9	46.5 20.8	.1 .1	1.9 .4	.1 .01	.1 .1	8.4 5.1	.3 2.5	.1 .1

Table 40. Locus G Fire Cracked Rock (Total Sample)

FCR	Merrimack Quartzite	Granite	Other Quartzite	Diorite	Quartz	Sand- stone	Total
Number	115.0	35.0	9.0	6.0	1.0	2.0	168.0
% by Number	68.4	20.8	5.4	3.6	.6	1.2	100.0
Weight in Grams	3118.0	1374.0	383.0	417.0	30.0	15.0	5337.0
% by Weight	58.4	25.7	7.2	7.8	.6	.3	100.0

from vessel 7 were found in N16E17, and only sherds from vessel 8 were found in N18E19 and N18E20.

Vessel 8 (Figure 32d) was tempered by medium to coarse fragments of quartz and pink feldspar, probably from crushed granite cobbles. The temper was so coarse and abundant as to make these sherds quite crumbly, so that few sherds had both the inner and outer surface intact. Inner surfaces were smoothed, and the outer surface of the vessel had also been smoothed all over, to a degree approaching burnishing. The shape and size of the vessel could not be reconstructed, because of the small and crumbly nature of the sherds, but the rim varied from rounded to somewhat flattened. Decoration was on the outer surface only, and consisted of several bands of decoration. First was a band of incised crosshatching starting just below the lip and extending down about two cm. Some sherds suggest a line of punctations may have circled the vessel just below the band of crosshatching. Then a band of rocker stamped decoration, which overlaps with the crosshatching on a few sherds, was applied. The stamping tool consisted of a thin curved edge with a single triangular tooth

at one end, with a total length of only one cm. It was held horizontally and rocked up or down the vessel several times. There was probably only one band of this rocker stamping, as most of the sherds from this vessel have a smooth outer surface.

Vessel 7 (Figure 32e, f) had very different temper, so could be distinguished even in small sherds. The tempering material included quartz, mica, and mafic minerals, and was less abundant and more carefully crushed than in vessel 8, so that sherds are less crumbly. Coil breaks are evident on numerous sherds. Again, shape and size cannot be determined, but there was no evidence of a marked neck on this vessel. The rim was rounded, but some rimsherds were slightly beveled, as if a flat, hard object had been passed over the wet clay around the rim. Rim sherds also tended to be sandier than body sherds from this vessel, suggesting that the vessel may have been placed upside down in sand while it was still moist, perhaps in the process of working the base of the vessel. The vessel's outer surface had been smoothed and then decorated around the rim with a dentate stamper consisting of a single row of four oval to rectangular teeth, and having a total length of 1.25 cm. The tool was stamped perpendicular or at a slight diagonal to the rim, starting .8 cm down from the lip, and stamps were about .5 cm apart. There were also several additional bands of stamping on the body of the vessel, and most sherds showed at least some stamping. The body may have been decorated with a different stamper; marks are slightly larger, the stamps are closer together, and marks are less distinct than are those near the rim.

Lithic artifacts were found in nearly every square, except those at the west and south ends of the locus. Remains of four or five projectile points were found, but only one was complete. This was artifact 1, a small triangular projectile point with a convex base and tiny side notches (Figure 30n). It is widest at the base, with maximum blade width of 1.4 cm and stem length

of .5 cm. The point is thin and carefully chipped, though the tip is a bit blunt. There is fairly heavy rounding wear evident under the microscope just above the shoulders, and the tiny notches appear to have been ground a bit. The size of this point is within the range of Madison points, but well below that for Meadowoods (Ritchie 1971). The point obviously does not fit within any of the standard types for the Northeast, and the nearest analogs may be the "untyped thin sidenotched" points from the Middle Woodland Felix site in New York State (Ritchie 1980:240 and 244).

All other projectile points are fragmentary. Artifact 2 is the corner of a possible Levanna point which may have been re-used as a drill, as there is heavy rotary wear for about .4 cm along the very tip. Artifact 5 is another corner of a triangular point, perhaps of a Madison point. Artifact 4 is the base of what may have been a stemmed point, or perhaps of a drill or knife. Finally, a fragment of a thin biface was found during the survey at this locus, but as the tip and base were both broken off, it is impossible to say what point type was represented.

Artifact 6 was a tiny microdrill, four sided and with a slightly expanded base (Figure 30o). The tip was apparently broken, and this may be why no wear was visible. The width at the tip was just .25 cm. In shape and mode of manufacture this drill was similar to those from the Late Woodland Calf Island site (Luedtke 1980a), where it was suggested that they had been used in the manufacture of shell beads. Without use wear, it is impossible to suggest what the Locus G drill was used for, but it was almost certainly hafted, as were the Calf Island microdrills.

Five tools were apparently used as scrapers. Artifact 7 is a thumbnail scraper, broken across the base and worn and rounded along a 2.5 cm working edge (Figure 29i). Artifact 9 is a core used as a scraper along a one cm edge, which shows heavy wear and rounding. Artifact 33 is another core used

for scraping along a 1.2 cm edge, and one edge of artifact 31 appears to have been used as a spokeshave. The wear on all these scraping tools is difficult to define further because all were quartz, which is particularly intractable for use wear studies. However, the rather heavy nature of the wear suggests use on resistant materials. Artifact 8, on the other hand, is a small felsite flake utilized on the distal edge, with very delicate scraper wear suggesting use for a precise or careful scraping task.

One other core, artifact 27, had an edge with an acute angle, adjacent to a large area of pebble cortex, which had apparently been used for cutting tasks. The working edge would have been about eight cm in length.

The most abundant tool type at this locus was hammerstones. Five of the hammerstones found appear to have been used for stone knapping or other tasks where blows must be concentrated on a small area of the object being impacted, while six show evidence of more diffuse pounding (see Chapter 6 for discussion of hammerstone functions). Three of the former type of hammerstone are also unusually small. They would appear to have been too light and small to be useful in percussion flaking, and the location of the battering on them does not suggest use for indirect percussion flaking, unless they were used with a wooden mallet. Their use is thus unknown. Cores 22 and 28 also have battering along thin edges that suggest they may have been used as hammerstones, though this wear could also result from processes of core reduction. Other cores show no signs of use.

Three fragments of graphite were found at this locus, from squares N16E17, N16E19, and N18E19. All were small, between one and two cm in maximum dimension, and all were worn and scratched.

At the other loci at Shattuck Farm, debitage here consisted largely of white quartz and grey felsite, with quartz predominating, plus a variety of other minor material types (Table 38). The most unusual minor type was a very fine grey argillite that weathers to tan; the edges of flakes made from

this material were invariably rounded and softened by weathering.

Flake quantities were greatest in the central excavation block and to the east, while flakes were sparse to the west and south of the locus. The size distributions are different for the different material types, suggesting that they were used differently. The quartz flakes were 1% big in size, 9% medium, 49% small, and 41% tiny, and 16% of the quartz flakes had areas of cortex. A similar pattern was found for the minor materials such as argillite, rhyolite, and quartzite, with 1% big, 2% medium, 57% small, and 40% tiny flakes, while 3% of all flakes showing cortex. The lower frequency of cortex flakes and fewer representatives of the larger size classes are a reflection of the generally greater distances these materials traveled to reach the site, as compared with quartz, which was available locally. Felsites showed a different pattern, with 2% medium, 39% small, and 60% tiny flakes, with 3% of all flakes showing areas of cortex. This heavy concentration in the smaller size ranges suggests late stages of biface reduction.

Fire cracked rock was sparse at this locus compared with some of the others, and 30% of the total came from a single square, N10E33. In the central block there was an average of only 10 fragments, about 200 grams, per square meter. Concentrations were slightly higher in the squares with fire features. In terms of composition, there was somewhat greater use of granite and quartz here than at the other loci, although Merrimack quartzite still predominates in the fire cracked rock assemblage (Table 40).

Historic artifacts from this locus include bits of brick, rusty fragments of metal, and numerous fragments of coal/cinder/slag. Small quantities of bottle and window glass were found, as well as fragments of glazed ceramics. A piece of a plastic container, a jet bead, a doll's glass eye, and a shotgun cartridge base complete the list of historic artifacts. This assemblage suggests normal field scatter, plus traces of hunting, picnicking, and children's play

activities.

This locus produced numerous features, and this is part of the reason why we expanded the central block in order to look for patterning. Features in this central block are shown in Figure 24. Feature 1, in N10E33, is a firecracked rock concentration in the northwest corner of the square, measuring 25 cm north to south and 50 cm east to west. It extended from 32 to 40 cm in depth, and was not associated with much charcoal or reddened soil. The rocks also did not appear to have been packed into place, as with rock platforms elsewhere at Shattuck Farm, and this concentration may represent materials swept from a hearth and piled to one side. Numerous flakes and some sherds were associated.

Other features include two areas of fire-reddened soil. One, feature 2, is located in N17E17 and was truncated by the northeast corner of the square (Figure 25). It consists of reddened soil with a dark charcoal stain in the center, and extends from 37 to 50 cm in depth. The charcoal is primarily from hardwoods. If its size is extrapolated, it would have been about 50 cm in diameter, with the dark central stain about 17 cm in diameter. A second feature of this type, feature 3, was found in N18E19. It is oval and measured 25 cm along the northeast/southwest dimension, and 15 cm across. It was first observed at 43 cm and extended to 50 cm in depth. It produced dicot charcoal and no artifacts. Finally, feature 4 is apparently a small ash pit next to feature 2. It appeared as a charcoal stain in the north wall of N17E17, and was about 13 cm in diameter. It was approximately bowl shaped, and extended from 37 to 45 cm. It may have been a small depression scooped out to bury ashes from the adjacent fire area.

The most abundant features at this locus were obviously the postmolds, which showed considerable variety in their attributes (Table 41). Each was measured from the depth at which it was first noticed, usually the base of

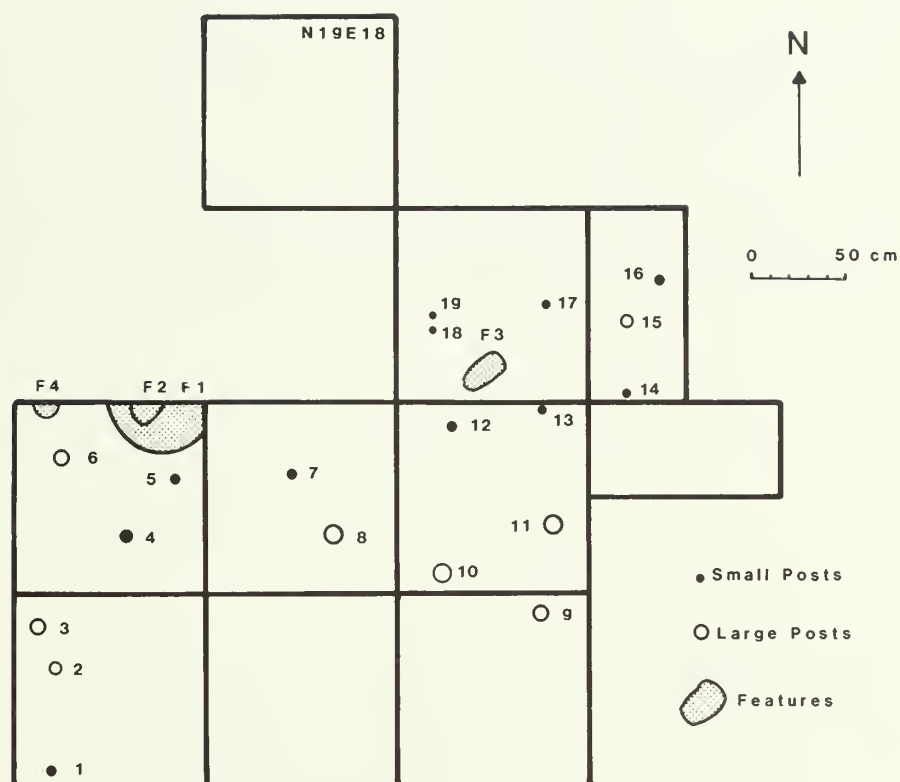


Figure 24. Locus G, Map of Features in Central Block.



Figure 25. Locus G, Feature 2. Red earth stain in center right, with charcoal stain in center. North wall of N17E17.

the plowzone, to its total depth in cross-section. The diameter at the top of the postmold was measured, and the shape of the base was noted. Tapered bases thinned to a point, one two cm in diameter, while rounded bases were of uniform diameter right to the base, which was slightly convex. Many postmolds appeared to have been set in the ground at an angle, so we noted the orientation of the postmolds, standardized here as the direction the top of the post would have pointed. This angle was usually only  $10^{\circ}$  or less from the perpendicular.

Examination of these variables through scatter plots of the continuous variables and contingency tables for the others immediately suggested that there were two distinct populations of postmolds present. The differences

Table 41. Locus G Postmolds (Dimensions in Centimeters)

Number	Square	Depth First Observed	Depth at Base	Diameter	Shape of Base	Post Top Orientation
1	N16E17	43	49	7	rounded	perpendicular
2	N16E17	43	88	7	tapered	pointing east
3	N16E17	43	55	7	rounded	pointing southwest
4	N17E17	40	44	6	rounded	perpendicular
5	N17E17	39	46	6	tapered	perpendicular
6	N17E17	39	50	7	tapered	pointing southeast
7	N17E18	40	47	6	rounded	pointing north
8	N17E18	45	65	10	tapered	pointing south
9	N16E19	43	64	8	tapered	pointing north
10	N17E19	38	58	10	tapered	pointing west
11	N17E19	34	59	10	tapered	pointing south
12	N17E19	45	48	5	rounded	perpendicular
13	N17E19	45	48	5	rounded	perpendicular
14	N18E20	45	48	3	rounded	perpendicular
15	N18E20	45	61	7	tapered	perpendicular
16	N18E20	45	53	5	rounded	perpendicular
17	N18E19	43	50	4	rounded	perpendicular
18	N18E19	43	47	3	rounded	perpendicular
19	N18E19	43	47	3	rounded	perpendicular

	N	Mean Length	Base Shape	Post Orientation
Small Posts	11	4.7 cm	10 rounded 1 tapered	10 perpendicular 1 tilted
Large Posts	8	21.2 cm	1 rounded 7 tapered	1 perpendicular 7 tilted

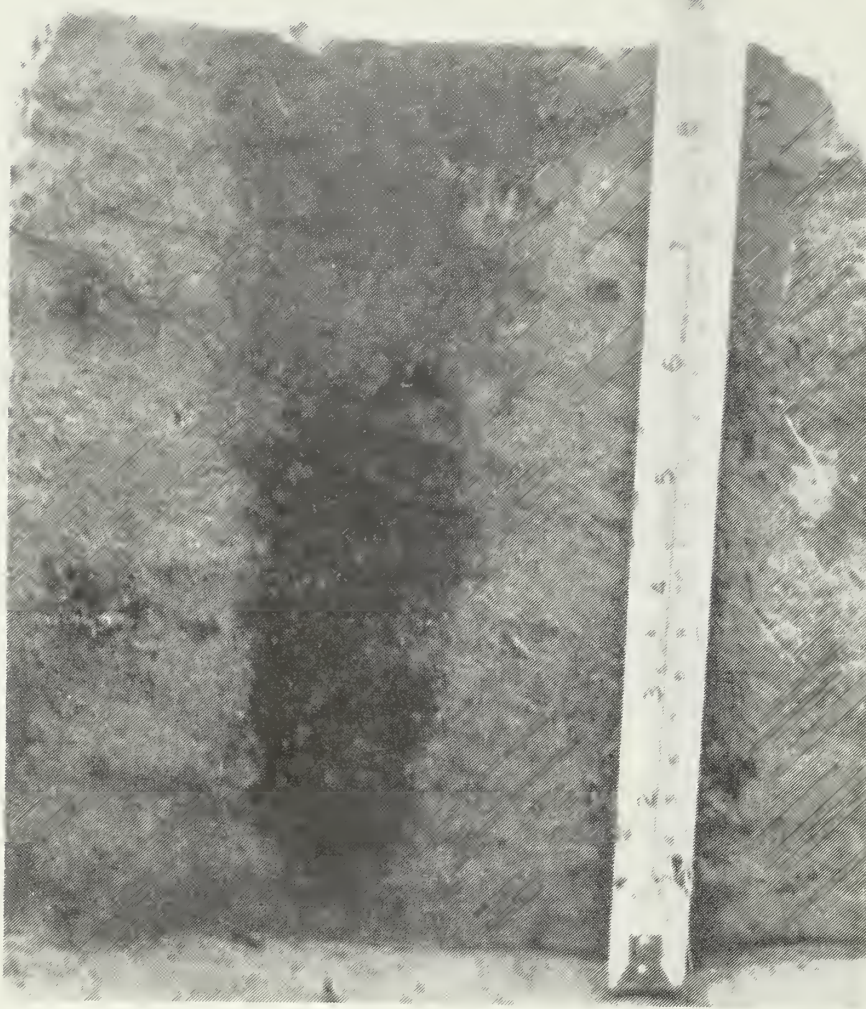


Figure 26. Locus G,  
Postmold #9.  
In N16E19.

between these two populations are both statistically significant and obvious (Table 41). Basically, larger posts, or those over six cm in diameter, had pointed bases, were inserted deeply into the ground, and were usually inserted at a slight angle. Figure 26 shows a typical large postmold. Smaller posts, those six cm in diameter and under, had rounded bases, were inserted shallowly into the soil, and were generally perpendicular to the ground surface. This latter statement is open to question, however, because the length of postmold remaining for small posts may simply have been too short to detect a slant. The depth differences were very striking, though; only one large post had a length under 11 cm, while none of the small posts was greater than eight cm

in length. Postmold 1 is 7 cm in diameter but matches the small posts for all other attributes, and has therefore been grouped with them.

It would seem most reasonable to assume that the larger posts are parts of primary structures such as shelters, and since they bore heavy loads, they had to be inserted deeply into the soil. This was made easier if the base was tapered to a point. It has been noted that the supporting poles of many historic domed wigwams were set in the ground "with an outward slope to aid resistance against the stress set up when the tops are bent inward." (Sturtevant 1975:443), and thus the angle of these larger postmolds also supports the suggestion that they are the remains of structural walls.

Smaller posts may have been parts of secondary constructions such as racks, sleeping platforms, etc. They would not be bearing such heavy loads, so would not need to be inserted deeply in the soil. It was therefore not necessary to modify the bases, and posts could be used essentially as they had been cut.

If the above assumptions are true, then the distribution of postmolds at Locus G begins to form a pattern. The line of south-facing poles through the center of the main block may have been the wall of a structure. All but one of the small posts are north of this line, as are both fire areas and the small ash pit. This line also marks a boundary between several other kinds of material remains, although the boundary is not absolute because of plowing. The majority of sherds from vessel 7 are south and west of the line, while most of vessel 8 is north of it. Felsite makes up from 50-80% of the debitage north of the line, but only 10-34% of the debitage south of the line. Most of the quartz cores were also found south of the line. Other remains, including bone remains, were the same both inside and outside the hypothetical structure line.

It is possible that two different families lived in close proximity at

this locus, but it seems more likely that the distribution of materials here indicates two episodes of use of the area. The first people to settle here built a structure with a small cooking hearth in it. The four small posts spaced neatly around this feature suggest a small rack for suspension of food or of cooking pots. It is not clear what the other small posts were used for.

The second fire feature to the west may have also been used by the same people, though it seems rather close to the first and is more likely to have been made by later inhabitants of the area, who seem to have overlapped the earlier occupation slightly. This second occupation may have been made by the same group, returning after a year's absence, or may represent a settlement several hundred years later. The ceramic style is considerably different, but we do not have sufficient insight into Middle Woodland ceramics to say whether it could have been contemporary with vessel 8. It is more difficult to relate any of the postmolds to this second occupation as they do not form much of a pattern. However, a dentate stamped sherd from vessel 7 was found in postmold 4, indicating that this postmold probably dates to the second occupation.

Both groups appear to have used the locus during the same time of year, surely May or June when the sturgeon would have been running upstream and when some nights would be cool enough to warrant the construction of a shelter. Both groups also caught turtles and mammals, perhaps including deer. They may have used hammerstones for processing these animal materials, and hammerstones may also have been used for processing various marsh plants available nearby, some of which are best harvested in the spring (Densmore 1928). The earlier group knapped grey felsite, perhaps in the course of refurbishing their tool kits after a long winter. The later group knapped primarily quartz. Both groups appear to have been relatively small; we are clearly at the western

edge of the settlement, but the remaining non-marsh area to the east is not large.

A charcoal sample from N16E17 was submitted for radiocarbon dating. It was a very small sample made up of bits of charcoal scattered through the midden in that square, so it was not surprising, though it was very disappointing, that a date of  $695 \pm 145$  radiocarbon years BP, or AD 1255, (C-13 corrected, GX-9003) was obtained. The date is too young for the clearly Middle Woodland materials, and may have been contaminated by the historic furnace and fireplace sweepings that were often spread on fields in this area. More charcoal is available, now, and further dates may be run at some future time.

This locus is primarily Middle Woodland in age; two sherds may possibly be of earlier age and six are probably later, but the rest date to the same general period. This is thus the closest we have to a single component locus at Shattuck Farm, and this fact, plus the area's markedly swampy location, makes this locus unique. The obvious question is why Middle Woodland people chose to camp at a location generally avoided by earlier and later people, and during a season when the locus would have been especially wet and unpleasant.

It is possible that the locus was not always as marshy as it is today. Much of the marsh east and southeast of the locus has been modified by activities related to the construction of Interstate 93, and the major swamp to the north of the locus is apparently of earlier historic origin. We took cores in this marsh to determine its age and in the hope of obtaining paleoenvironmental information, and samples of bark from 152-159 cm deep and from 93-87 cm deep produced radiocarbon dates of  $-110 \pm 120$  (GX-9005) and  $20 \pm 145$  (GX-9004) radiocarbon years BP. These samples may be contaminated, but analysis of pollen profiles from these cores confirms the fact that the marsh began to form during historic times (Kelso, Appendix III). Thus, McDowell concludes that the original riverbank lay just to the north of Locus G.

Perhaps the modern riverbank in this area, which lies well to the north of the marsh, was created by historic farmers in order to have a farm access road parallel to the river bank.

However, the soils at this locus today are primarily clay, rather than the sands typical of the rest of Shattuck Farm, and they were moist to the touch even in mid-summer. McDowell indicates that the prehistoric soils were also peaty for the most part, unlike the well-drained soils typical of the rest of Shattuck Farm. Yet the locus was apparently dry enough at one point in historic times to warrant plowing and farming there. It may be that conditions at this locus vary considerably depending on local fluctuations in groundwater, and that during the Middle Woodland period the water table was temporarily lower, thus allowing a spring occupation.

A second possibility is that the area was indeed marshy in Middle Woodland times, and that the dense marsh vegetation provided some protection from the cold, sharp spring winds, as it does now, and also perhaps from the eyes of enemies. New England Indians traditionally sought the protection of marshes when they were in danger of attack by enemies, or when they wished to approach or camp in areas where they felt insecure. Perhaps Locus G marks the camping places of people who wished to remain inconspicuous at Shattuck Farm.

Resolution of the question of why Middle Woodland people settled in a marsh will require further work on the geology and geomorphology of the marsh. It does seem clear that earlier and later people used this area primarily for hunting, trapping, and collecting plants, and not for settlement. The few stray sherds of different time periods may even have been brought to the area by plowing. The result is an unusually clear picture of the activities of a limited number of people at some period or periods during the Middle Woodland.

## LOCUS H

Locus H is located at the eastern end of the kame terrace and is similar in some ways to Locus C (Figures 27 and 28). It is situated on a knoll extending into the large marsh at the eastern end of the Shattuck Farm project area, and it is on two levels: the southern end reaches elevations of about 18 meters, and the locus steps down to a lower level at about 15 meters above sea level. Datum H is located at 16.5 meters above sea level. The entire locus is about 3000 square meters in size. Marsh to the north and west divides this locus from Locus G, while a deep ditch for drainage divides this locus from the Spinach Field area further west and south (see end of this chapter). There is also a drainage ditch to the east, running parallel to Interstate 93. This may, however, have been the general location of a stream that originally flowed through this area to Shattuck's Pond. Assuming a stream did run along the east side of this locus, the distance to it would have been 25 meters. The north edge of this locus is also 125 meters from the Merrimack itself. It is covered by mixed coniferous and deciduous forest, and is relatively free of undergrowth.

This locus was discovered during the survey; collectors do not report much interest in this area, though they were active just to the southwest in the Spinach Field. The Barry collection, much of which is from the kame terrace, includes a considerable amount of pottery, some of which is likely to be from this locus.

We excavated a random sample of seven squares, plus one additional nonrandom square located at the far southeast end of the area. This latter square was excavated in an attempt to locate the site boundaries, but as it only produced several dubious fragments of fire cracked rock, it was not included in the tables for this locus.



Figure 27. Locus H, Site View from Northwest.

There was no evidence of plowing at this locus; perhaps its peripheral location, with marsh and wetland on three sides, protected it. There is also a stone wall to the south of the locus, separating it from the main farming fields. The drainage around the locus has clearly been altered, and parts of the locus may have been disturbed by this process. There is also a packed dirt road visible running from east to west along the northern end of the locus, probably related to the construction of I-93. There are a few pits on the upper level of the locus, possibly representing three throws or pothunters' holes. Rodent burrows were found in two of the pits, and the frequent occurrence of other active burrows in the area suggest that rodents may have disturbed

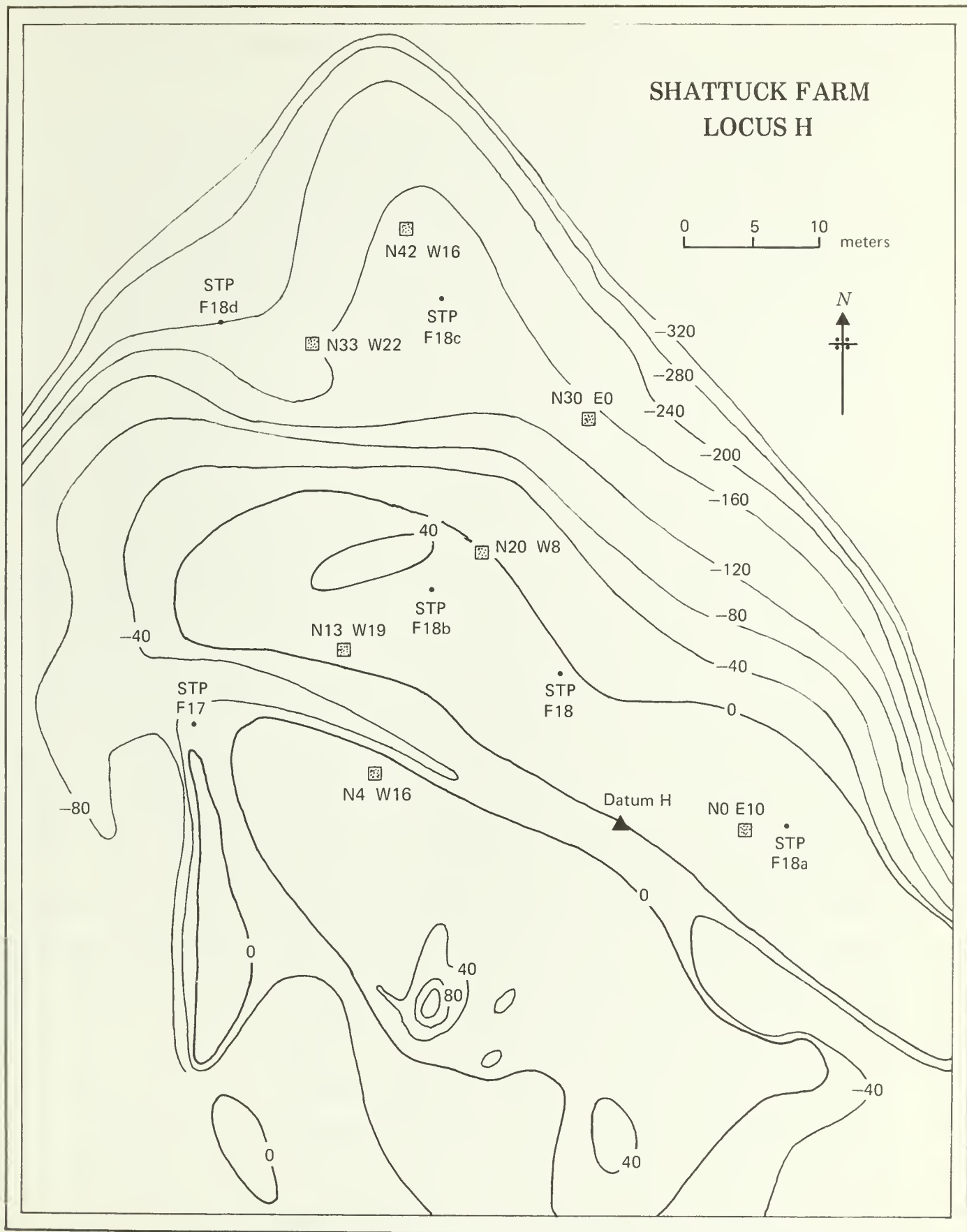


Figure 28. Map of Locus H.

parts of the locus. Other than that, the locus shows little evidence of disturbance.

The soil profiles are a little different on the two levels of the locus. At the southern, or higher end, the top 15 centimeters is medium dark brown (10YR 3/4) fine soil, relatively free of pebbles. From 15 to 45 centimeters the soil was yellow orange (10YR 4/6) in color and filled with pebbles. Below 45 cm the soil became even rockier and coarser, as well as a little lighter in color. On the lower, or northern level, the top 25 cm of soil is dark brown (10YR 2/2) sandy loam with just a few pebbles. From 25 to 40 centimeters the soil is sandy and yellow (10YR 5/6), and it becomes paler with greater depth.

Figures 42 through 47 describe materials excavated from this locus. Bone remains from this area included 28 fragments of turtle shell (2.1 gm), 18 fragments of sturgeon scute (4.4 gm), 12 fragments of unidentifiable bone (1.8 gm), and three modern rabbit bones (1.7 gm). The turtle remains were primarily from the pits on the west side of the locus, while the sturgeon remains were nearly all from pit NOE10. In addition, this locus produced the only pieces of worked bone found during our excavations, both from square N33W22. The first is a small tapered bone point, oval in cross-section with dimensions of 1.42 cm in length, .66 cm maximum width, .33 maximum thickness, and with a weight of .2 grams. Small cut marks are still visible on the calcined bone. The second fragment is from the same square and level, and may be a fragment from further along the shaft of the same point. It is rectangular and 1.45 long, .57 cm wide, .46 cm thick. One face shows scraping and cut marks.

Flotation was performed on soil from several stains at this locus, but no floral remains were found other than miscellaneous charcoal fragments. Fragments of four hickory nut shells were found in square NOE10, overlapping in their depth distributions with the sturgeon bone fragments. These two types of food were harvested at different seasons of the year and their

Table 42. Locus H Excavated Materials: Random Sample (= Total Sample) (N=7m<sup>2</sup>)

Depth	Bone # gms	Ceramics # gms	Lithic Artifacts	Flakes # gms	FCR # gms	Historic # gms	Features
0							
5							
10							
15							
20							
25							
30							
35							
40							
T							
	64 10.6	892 407.8	11	294 273.8	279 11392	17 48.6	
	1 .2	6 1.4		6 4.6	18 729		
	12 3.0	13 3.8	#9	16 27.8	37 2935		
	10 1.5	5 4.8		44 46.4	21 445		
	25 2.4	86 50.9	#7, 8, 10	31 33.6	41 1833		
	11 1.8	531 253.8	#2, 5	88 87.2	63 3432		
	3 .2	184 72.4	#1, 11	81 52.8	47 984	1 .9	
	2 1.4	49 14.1	#6	18 12.5	41 693	8 20.7	
			#3, 4	10 8.9	11 341	8 27.0	

Table 43. Locus H Ceramics (Total Sample)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#1	NOE10 15-20 cm	3	6.0	medium grit	medium grit	.9	smooth	smoothed cordmarking	—	—
#2	NOE10 15-20 cm	2	1.5	medium shell	reddish	.85	smooth	incising over cordmarking	—	—
#3	NOE10 15-20 cm	1	1.2	medium shell	tan, with black inside	.7	smooth	shallow incising	—	—
#4	N4W16 0-18 cm	7	3.3	medium grit	brown	.7-.8	smooth	cordmarked, fine	—	—
#5	N4W16 10-25 cm	20	43.4	coarse grit	reddish, sandy	1.05-1.1	cord- marked	cordmarked	—	—
#6	N4W16 10-15 cm	16	16.4	medium grit	medium brown	.77-.9	smooth	dentate stamped, rectangular teeth	—	—
#7	N13W19 0-15 cm	27	8.2	medium- fine shell	grey	>.55	smooth	cordwrapped stick impressed	—	—
#8	N13W19 5-10 cm	1	1.7	medium grit	yellowish sandy	>.6	smooth	square dentate stamped	—	—

Table 43. Locus H Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#9	N13W19 0-15 cm	54	13.4	medium grit	grey & reddish	.5-.6	smooth	straight rocker stamped	flat	—
#10	N13W19 10-20 cm	6	3.4	fine grit	medium brown	.3-.5	smooth	smooth	rounded	minia- ture
#11	N13W19 15-20 cm	1	2.4	coarse grit	grey	.75	cord- marked	cordmarked	—	carbon on interior
#12	N13W19 15-20 cm	11	9.1	medium grit	brown, sandy	.85	smooth	punctate	—	—
#13	N20W8 10-15 cm	3	7.0	fine grit	dark grey	.8	smooth	smooth	—	—
#14	N33E20 25-30 cm	2	3.0	coarse grit	sandy, brown	>1.1	cord- marked	cordmarked	—	—
#15	N42W16 5-35 cm	590	240.0	coarse grit	reddish, sandy	.5-1.0	cord- marked	cordmarked	rounded	coil breaks
#16	N42W16 10-15 cm	84	24.8	medium grit	olive brown	.55-.6	smooth	oval dentate stamped	flat, protrud- ing to outer side, dentate stamped	—

Table 43. Locus H Ceramics (Total Sample) (Continued)

Vessel	Squares	# Sherds	Grams	Temper	Paste	Thickness	Inside	Outside	Rim	Other
#17	N42W16 0-25	65	22.6	medium grit	brown	.5	smooth	smooth	rounded	—
#18	N42W16 5-10	1	.4	medium grit	brown	.42 (at rim)	smooth	cordmarked	flat	—
#19	N42W16 35-40 cm	6	1.4	medium grit	yellowish brown	.5 (at rim)	smooth	smoothed cordmarking	rounded	—

Table 44. Locus H Lithic Artifacts (Total Sample)

Artifact #	Square	Material	Length	Width	Thickness	Weight	Description
1 (207/1768)	N42W16	dark grey felsite	2.3	1.3	.5	1.5	biface fragment; probably edge of Levanna projectile point
2 (207/1659)	N0E10	dark grey rhyolite	2.8	2.6	.8	4.8	triangular biface with broken base
3 (207/1756)	N42W16	grey felsite	2.8	2.0	.7	4.0	end scraper, broken parallel to working edge (Figure 30 p)
4 (207/2211)	N4W16	white quartz	3.1	2.5	1.1	9.5	oval scraper
5 (207/1658)	N0E10	pink quartzite	6.5	5.0	2.7	85.2	cobble hammerstone
6 (207/2218)	N4W16	grey quartz	6.8	5.8	4.4	208.2	cobble hammerstone
7 (207/1594)	N13W19	yellowish Merrimack quartzite	7.1	4.5	3.8	164.2	cobble hammerstone
8 (207/1447)	N30E0	white granite	5.3	4.2	2.0	52.3	river cobble hammerstone
9 (207/1564)	N42W16	yellowish grey quartzite	4.5	3.0	2.2	43.2	pebble hammerstone (Figure 31f)
10 (207/1788)	N42W16	yellow quartz	6.7	5.3	4.0	164.5	cobble hammerstone
11 (207/1766)	N42W16	grey quartz	3.3	2.6	1.5	15.1	core, possibly also used as a scraper or hammerstone

Table 45. Locus H Flake Numbers and Weights (Total Sample)

Depth	Quartz #	Quartz gms	Grey Felsite #	Grey Felsite gms	Grey- Green Felsite #	Grey- Green Felsite gms	Pink Felsite #	Pink Felsite gms	Brown Felsite #	Brown Felsite gms	Grey Rhyolite #	Grey Rhyolite gms	Grey Chert #	Grey Chert gms	Grey Quartzite #	Grey Quartzite gms	Grey Basalt #	Grey Basalt gms	Total #	Total gms
0	4	1.7	6	7.2															10	8.9
5	8	2.8	9	7.4			1	2.3											18	12.5
10	14	35.6	65	15.8									1	.2	1	1.2			81	52.8
15	20	47.6	38	10.7					2	1.0			2	1.5					88	87.2
20	13	21.2	17	10.6															31	33.6
25	7	9.4	3	1.2							1	.4							44	46.4
30	7	12.8	8	14.6													1	.4	16	27.8
35	4	4.2	2	.4															6	4.6
40	76	135.3	148	68.0			1	2.3	2	1.0	1	.4	3	1.7	1	1.2			294	273.8

Table 46. Locus H Flake Percentages (Total Sample)

Depth	Quartz # gms	Grey Felsite # gms	Grey- Green Felsite # gms	Pink Felsite # gms	Brown Felsite # gms	Grey Rhyolite # gms	Grey Chert # gms	Grey Quartzite # gms	Grey Basalt # gms
0									
5	40.0 19.1	60.0 80.9							
10	44.4 22.4	50.0 59.2		5.6 18.4					
15	17.2 67.3	80.2 30.0					1.2 .4	1.2 2.3	
20	22.7 54.6	43.2 12.3	29.5 30.3		2.3 1.1		2.3 1.7		
25	41.9 63.0	54.8 31.6	3.2 5.3						
30	15.9 20.3	6.8 2.6	75.0 76.3			2.3 .9			
35	43.8 46.1	50.0 52.4							6.2 1.4
40	66.7 91.3	33.3 8.7							
T	26.1 49.3	50.3 24.8	20.4 23.2	.3 .8	.7 .4	.3 .1	1.0 .6	.3 .4	.3 .1

Table 47. Locus H Fire Cracked Rock (Total Sample)

FCR	Merrimack Quartzite	Granite	Other Quartzite	Slate	Quartz	Diorite	Ferrous Material	Total
Number	210.0	34.0	11.0	11.0	11.0	1.0	1.0	279.0
% by Number	75.3	12.2	3.9	3.9	3.9	.4	.4	100.0
Weight in Grams	8313.0	1804.0	583.0	386.0	270.0	4.0	32.0	11392.0
% by Weight	73.0	15.8	5.1	3.4	2.4	.04	.3	100.0

co-occurrence here suggests either that one or the other was stored, or that the area was occupied regularly during both the spring and fall.

Ceramics from this locus include Early, Middle, and Late Woodland styles. This is the only area other than Locus C with quantities of Early Woodland ceramics, and they are localized in the western part of the locus, suggesting that the major early Woodland occupation was further west toward the center of the kame terrace. Middle Woodland sherds were found in all squares, but were also most abundant in the western part of the locus. The Late Woodland sherds were nearly all found on the upper, or southern, level of this locus, suggesting either orientation toward non-riverine resources, or possibly that the marsh was somewhat higher and the lower areas less hospitable then.

One small triangular projectile point with its tip broken was found during the survey (Mahlstedt 1981), and fits within the size range for Madison points. None were found in these excavations, but one fragment of a thin and carefully worked biface edge is probably from a Levanna point (artifact 1). Artifact 2 is a thin but crudely made biface with wear traces indicating that it was used for a variety of delicate cutting and scraping tasks. Two scrapers were found;

number 3 is very carefully made and has faint striations perpendicular to the working edge, which is very evenly chipped (Figure 30 p). Possible use on furs is indicated by this wear pattern. Artifact 4 is thicker, has a less even edge, and has less obvious wear. The quartz core, artifact 11, is also heavily worn on its edges and may have been used for scraping tasks, though it is impossible to be sure because of the raw material from which it is made.

Hammerstones were the most abundant artifact from this locus, with at least one found in every square (Figure 31 f). Most were of a form that would be usable for knapping stone, but the lack of large quantities of debitage suggests that they were also used for some other task. They may have been used for processing plant materials such as nuts, or reeds, rushes, and bark used for cordage and basketry.

In addition to the lithic tools above, four graphite fragments were found at this locus. All were small, one centimeter or less in maximum dimension, and all showed clear signs of scratching and grinding on their surfaces. The total weight for all four was 1.1 gm, and they were all in squares N13W19 and N42W16.

Debitage from this locus included primarily quartz and grey felsite flakes, but there were also an unusual number of other varieties of stone present. The size distribution is remarkably similar for felsites and quartz: about 5% big flakes, 16% medium, 60% small, and 19% tiny flakes. Even chert and basalt, which occur in small quantities here, appear in proportions of 25% medium and 75% small flakes. This pattern is very different from that of areas with evidence of biface reduction activities, such as Locus B, where nearly 60% of all flakes were tiny. This is a further indication that stone knapping was not an important activity at this locus, and that the debitage results from normal activities of stone tool use, retouch, finishing, etc. The proportions of cortex flakes do differ between quartz and felsite, however, with 18% of the

former showing cortex, compared to 2% of the latter.

Fire cracked rock varies in quantity by square, and is most abundant in the squares that produced the most of the other types of remains. Very few historic artifacts were found, and all were from the top 10 cm, supporting the conclusion that this area has seen very little historic disturbance. Historic materials include four fragments of redware and creamware ceramics, six fragments of glass from jars and a beer bottle, five 22 caliber shells, and two shotgun cartridge bases. These remains probably reflect minor field scatter, plus the traces of recent picnicking and target shooting.

No features were encountered in this locus other than rodent burrows. There were a few red stains in the soils, but none definite enough to be treated as a feature by the excavators.

Despite the lack of obvious historic disturbance at this locus, there is not clear vertical stratification of components, though there is some rough zoning, with Early Woodland ceramics nearly always deeper than later ceramics. There is no evidence for components earlier than Early Woodland at this locus; one pit, NOE10, produced considerable quantities of debitage and sturgeon fragments below levels with ceramics, but this may be an aceramic rather than preceramic deposit. Most of the Early and Middle Woodland ceramics were found on the western side of the locus, while Late Woodland ceramics were found only on the southern part of the locus. This suggests different patterns of site usage for these periods. It is nearly impossible to assign seasonality or activities to any of the periods represented here, simply because of the lack of evidence. However, it is interesting to note that both of the scrapers were found within the top five centimeters of their squares, while most of the hammerstones were lower, between 15 and 25 centimeters below ground surface. The considerable variation in quantities and types of remains between squares suggests that camps at this locus were small and varied in location from year to year.

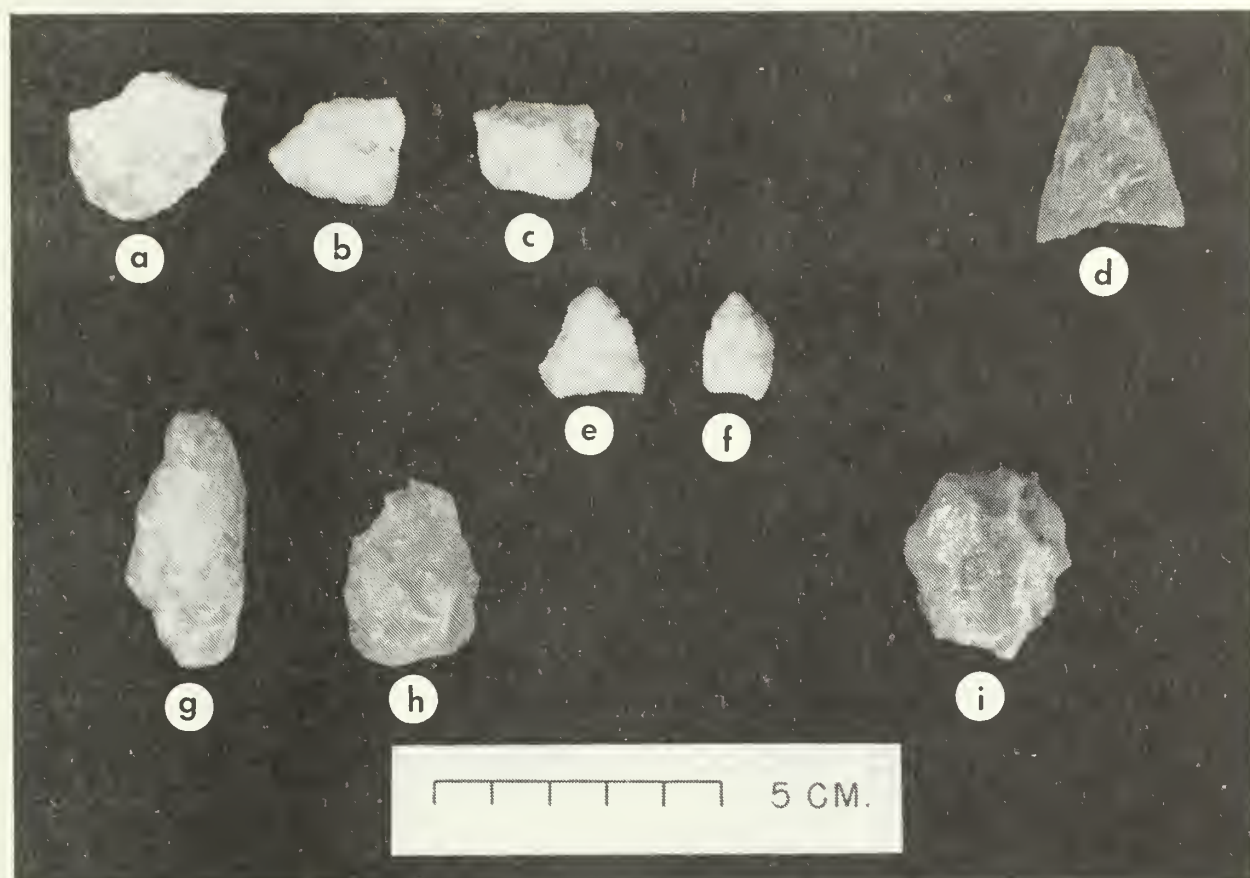


Figure 29. All Loci: Flaked Quartz Artifacts. a = Locus A artifact 3, end scraper; b = Locus A artifact 5, thumbnail scraper; c = Locus A artifact 9, thumbnail scraper; d = Locus B artifact 1, Levanna point; e = Locus D artifact 6, triangular projectile point; f = Locus D artifact 2, triangular projectile point; g = Locus E artifact 5, biface; h = Locus E artifact 8, biface; i = Locus G artifact 7, thumbnail scraper.



Figure 30. All Loci: Flaked Felsite Artifacts. a = Locus A artifact 2, triangular projectile point; b = Locus A artifact 1, biface; c = Locus B artifact 2, Madison point; d = Locus D artifact 1, expanding stem point; e = Locus D artifact 5, stemmed projectile point; f = Locus D artifact 8, small stemmed point; g = Locus D artifact 3, triangular projectile point; h = Locus D artifact 4, Levanna point re-used as drill; i = Locus D artifact 9, biface used as knife; j = Locus D artifact 13, biface; k = Locus E artifact 1, side-notched projectile point; l = Locus E artifact 2, small stemmed point; m = Locus E artifact 3, small stemmed point; n = Locus G artifact 1, side-notched projectile point; o = Locus G artifact 6, quadrilateral drill; p = Locus H artifact 3, end scraper fragment.

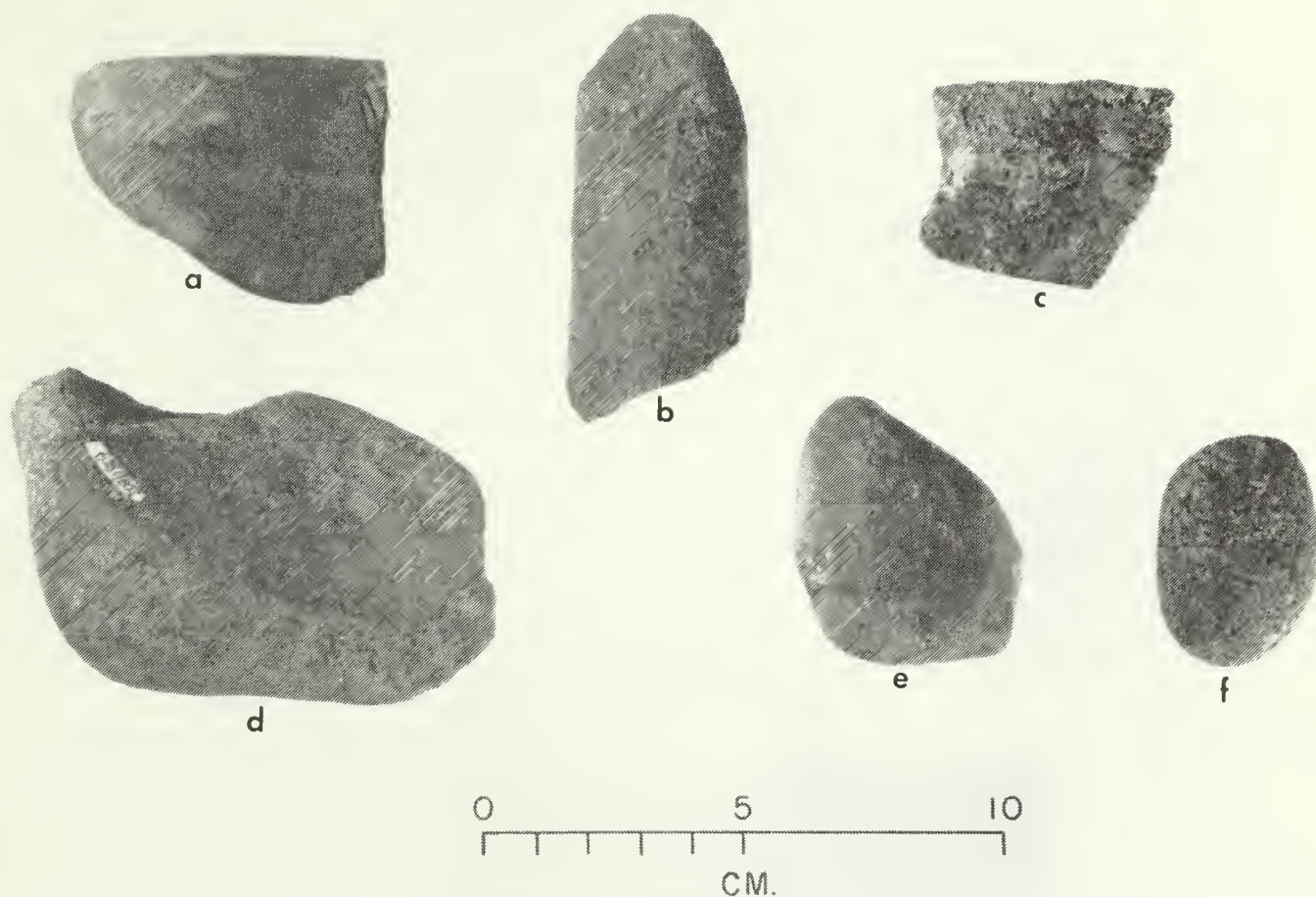


Figure 31. All Loci: Ground and Pecked Stone Artifacts. a = Locus D artifact 19, ulu fragment; b = Locus E artifact 10, pestle fragment; c = Spinach Field, D:F:12, soapstone bowl fragment; d = Locus G artifact 14, hammerstone probably used for pounding; e = Locus G artifact 16, hammerstone probably used for knapping; f = Locus H artifact 9, small hammerstone.



Figure 32. All Loci: Ceramics. a = Locus C vessel 1, Early Woodland rim sherd, cordmarked interior and exterior; b = Locus D vessel 14, Middle Woodland rim sherd and body sherd, rocker dentate stamped; c = Locus D vessel 24, Middle Woodland rim sherd, dentate stamped; d = Locus G vessel 8, Middle Woodland body sherd, rocker dentate stamped; e, f = Locus G vessel 7, Middle Woodland rim sherd and body sherd, dentate stamped; g = Locus D vessel 11, Late Woodland rim sherd, fabric impressed or cordmarked; h = Locus B vessel 3, Late Woodland rim sherd, linear stamped, slightly collared and castellated; i = Locus D vessel 48, Late Woodland rim sherd, diagonal cordwrapped stick impressed; j = Kame terrace D:E:7b, Late Woodland/Contact Period rim sherd, incised and collared.

## COMPARISONS BETWEEN LOCI

This section will present a series of tables and discussions of the broad differences and similarities between the different loci at Shattuck Farm. The diversity surely results from differences in the sizes and locations of settlements over time, as well as from differences in the spatial locations of different activities.

Table 48 shows the average quantities of different materials per meter square, based on the random sample of squares for all loci except Locus E, where only nonrandom squares were excavated. There is a pattern of considerable similarity for most material densities at most loci, but a few loci are unusual for each material. Materials will be discussed category by category, in the order they appear on the locus summary tables.

Bone was relatively uncommon at all loci, and always occurred in small calcined fragments. Locus E had by far the highest density of bone fragments due either to local soil conditions at this riverbank location, or perhaps simply to heavy deposition of bone in this area. Locus D, also heavily occupied, had the next greatest abundance of bone.

Table 49 shows all organic remains (other than charcoal, which was present in all squares) at each locus by type. Interpretation of this data is very tricky, as will be discussed in the next chapter, and I will not press these results further than to point out the ubiquity of turtle remains at all loci, and the nearly mutually exclusive relationship of bird and sturgeon remains. Bird remains were found in nearly all the western loci and sturgeon in all the eastern loci, with overlap only in Locus E. This difference may be the result of seasonal differences in locus use, although this interpretation is not particularly supported by the nut shell data. It seems more likely that the distribution results from the different locations at which birds and sturgeon

Table 48. Average Quantities per Square Meter, Based on Random Samples from Loci

Locus	# of Squares	Prehistoric Bone # gms	Ceramic Sherds # gms	# of Vessels	# of Lithic Artifacts	Flakes # gms	Fire Cracked Rock # gms	Historic Artifacts # gms	Prehistoric Features
A	9	3.6 .6	2.1 1.8	1.4	1.3	45.3 49.8	61.2 3568.3	130.0 683.0	.44
B	5	1.2 .2	10.0 5.5	.6	.6	34.0 33.5	31.2 3158.2	6.6 17.9	.40
C	7	3.3 .8	27.0 28.8	1.4	.3	4.0 1.8	19.1 467.1	16.6 28.2	.28
D	12	31.2 2.8	136.2 57.9	6.6	2.2	160.6 117.6	47.7 1213.7	2.8 6.2	.66
E	4.5	653.1 13.4	36.0 18.2	4.4	5.6	157.3 136.8	184.7 2883.8	7.3 4.0	.67
G	8	4.9 .4	18.4 14.2	1.2	1.9	28.0 18.6	8.6 291.2	15.1 35.1	.125
H	7	9.1 1.5	127.4 58.3	2.7	1.6	42.0 39.1	39.9 1627.4	2.4 6.9	0

Table 49. Faunal and Floral Materials by Locus (Total Sample)

<u>Locus</u>	<u>Turtle</u>	<u>Snake</u>	<u>Mammal</u>	<u>Bird</u>	<u>Sturgeon</u>	<u>Other Fish</u>	<u>Shell</u>	<u>Nuts</u>
A	+			+				+
B	+			+			+	
C	+		+	+			+	+
D	+		+	+			+	+
E	+	+	+	+	+	+	+	+
G	+		+		+		+	
H	+				+			+

were procured. Sturgeon would have been most easily taken at or below Peter's Falls, and larger specimens are not likely to have been transported far. Thus, sturgeon would be expected to have been procured and processed near the east end of Shattuck Farm. Birds, on the other hand, though probably obtainable in the marsh, might have been more abundant in the calmer waters above the falls, or in adjacent ponds and streams such as Spindle's Creek.

Ceramic densities are fairly similar for most loci, with the exception of Loci D and H. However, raw densities of sherds are misleading in the case of Locus H because so many of the heavy sherds come from a single vessel. Thus, when density of vessels is examined, Locus H is no longer anomalous. When ceramics are examined by temporal type (as discussed in Chapter 6), some interesting trends appear (Table 50). Early Woodland ceramics are virtually restricted to the kame terrace remnant sections; the single exception from Locus D is represented by a few small sherds and may be a stray. Middle Woodland ceramics predominate toward the eastern end of the site area. Shell tempered Late Woodland vessels are most abundant in the central part of the site, and fine grit tempered vessels of the later Late Woodland are most common toward the west end of the site area.

Table 50. Ceramic Vessels, by Locus and Temper Type (Total Sample)

Locus	Fine Grit		Shell		Medium Grit		Coarse Grit		Total
	#	%	#	%	#	%	#	%	
A	5	51.4	1	14.3	1	14.3	-	-	7
B	1	33.3	1	33.3	1	33.3	-	-	3
C	-	-	4	40.0	3	30.0	3	30.0	10
D	6	10.2	31	52.5	21	35.6	1	1.7	59
E	5	25.0	8	40.0	7	35.0	-	-	20
G	1	11.1	2	22.2	6	66.7	-	-	9
H	2	10.5	3	15.8	10	52.6	4	21.0	19

Worked lithic artifacts vary in frequency between about one and two per square meter, with a greater frequency at Locus E. This could be due to the relatively undisturbed condition of this area at the edge of the river, but by that argument, more artifacts should be expected from Loci A and H, which are also relatively undisturbed and uncollected. More likely, the larger number of artifacts and artifact fragments in Locus E simply reflects an intense level of activity in this area.

This unequal distribution of activity intensity is also supported by the data on flake frequencies in Table 48, which show a marked increase in flakes in Loci D and E, the loci most central and close to the river, and also the loci identified as the "heart" of the traditional Shattuck Farm site by collectors. Flake frequencies for the other loci are fairly similar except for Locus C, where virtually all kinds of materials were sparse. Table 51 shows the mean flake weight for each locus and again, with the exception of Locus C, mean values

Table 51. Average Flake Weight by Locus (Total Sample)

Locus	A	B	C	D	E	G	H
Mean Flake Weight, in grams	1.08	.79	.44	.72	.86	1.01	.98

Table 52. Mean Flake Weights for Different Raw Materials (Total Sample)

Material	Quartzite	Quartz	Other Felsites	Saugus Rhyolite	Chert	Argillite	Grey Felsite	Rhyolite
Mean Weight, in Grams	2.0	1.0	.9	.7	.6	.6	.5	.4

vary between .8 and 1.0 grams per flake. Flake weights vary by material, however, as shown in Table 52. This may reflect differences in the specific gravity of the various materials, but also reflects the varying ways in which each material was being used at this site.

Turning to a consideration of the variation in material types at each locus, a rather complex pattern emerges because of a variety of interacting factors. The raw material proportions left by inhabitants of a site at any one time period are determined by 1) the distance between the site and the source of the raw material, 2) the size of the inhabitants' territory and also of the territory they can exploit indirectly through trade and exchange, 3) how recently the inhabitants had exploited each source before coming to the site in question, 4) the kinds of activities occurring at the site, and 5) cultural and ideosyncratic preferences. Since Shattuck Farm was occupied by people of many cultures and time periods, the patterning of material types there is complex and not all the factors can be distinguished.

When raw material frequencies are summed for the entire site (Table 53),

Table 53. Flake Raw Material Proportions (Total Sample)

Material	Quartz	Grey Felsite	Other Felsite	Argillite	Rhyolite	Quartzite	Chert
% by Weight	80.3	13.2	3.2	1.3	.96	.95	.16

frequencies clearly reflect the distance between sources and the site. Over 80% of the assemblage is quartz, locally available, and most of the remaining volcanic and metamorphic materials are available within 30 to 40 klm of the site, not an unreasonable territory size. Chert, the only true "exotic" material, is present in appropriately low frequencies.

The distribution of material frequencies by locus presumably reflects factors 2 though 5 above, however (Table 54). Locus C is aberrant, primarily because of the very small sample size for flakes from this locus, but otherwise there is a general decrease in the proportion of quartz and an increase in felsites as one moves from west to east. Faunal and artifact data suggest that the eastern and western ends of the site were used at different seasons and differentially by people of various time periods, and either or both of these factors could be responsible for the shift in material frequencies. There is not a clear shift in material types by depth, however. This may be due partly to the degree of disturbance in most areas of the Shattuck Farm site, but may also be due to the fact that the shifts in lithic raw material preferences that are so clearly indicated for projectile points (Chapter 7) are not necessarily reflected in the rest of the lithic assemblages for different time periods.

Materials other than quartz and felsite are present in small quantities in all areas, and the widest variety of materials was found at Locus D, which also produced the largest sample of flakes. In fact, the correlation between the number of material types present and the number of flakes in the locus

Table 54. Flake Raw Material Proportions at Loci, by Weight (Total Sample)

Locus	Quartz	Grey Felsite	Other Felsites	Rhyolite	Quartzite	Argillite	Chert	Saugus Rhyolite
A	92.2	4.5	-	2.5	.6	.1	.02	-
B	100.0	-	-	-	-	-	-	-
C	12.0	88.0	-	-	-	-	-	-
D	83.9	11.8	2.4	1.4	.05	.06	.3	.1
E	83.2	12.7	2.2	-	1.8	.04	.1	-
G	70.8	20.8	.6	.1	2.4	5.1	-	.09
H	46.7	23.5	28.6	.17	.4	-	.6	-

assemblage is very strong, with Person's  $r = .87$ . The only loci deviating at all from a straight line relationship were Locus B, which was unusually homogeneous because most flakes are apparently from a single knapping episode, and Locus H, which was unusually heterogeneous (especially with regard to "other felsites") for unknown reasons. Jaspers occur only in areas where Middle Woodland ceramics are also abundant, and this agrees with the pattern found elsewhere in New England (Barber 1979:386). It is also notable that graphite was found at Loci E, G, and H, but not at the western loci.

Fire cracked rock is all available locally, so differences in proportions presumably reflect choice and random variation (Table 55). Fire cracked rock in all loci is composed primarily of Merrimack Quartzite, the local bedrock. Granites, diorites, and quartz are also present in the assemblages, and these materials can be easily found in glacial deposits near the site today, and presumably in the river bed in the past. The locus that differs most from

Table 55. Proportions of Fire Cracked Rock Raw Materials at Loci, by Weight (Total Sample)

Locus	Merrimack Quartzite	Granite	Quartz	Other Quartzites	Slate	Diorite	Miscellaneous
A	70.4	13.4	2.3	.02	4.0	9.9	.02
B	48.1	20.6	16.9	1.9	3.8	8.5	-
C	84.7	.8	2.7	5.3	2.2	4.3	-
D	78.2	13.8	.9	4.5	-	2.5	.2
E	81.9	11.2	2.5	2.9	-	1.4	.06
G	58.4	25.7	.6	7.2	-	7.8	.3
H	73.0	15.8	2.4	5.1	3.4	.04	.3

this common pattern is Locus B, where the fire cracked rock is nearly all from Feature 1, the hearth. Perhaps granite and quartz were preferred for such features. It is also possible that Middle Woodland people preferred those raw materials for their fire rock; Feature 1 produced a Middle Woodland radiocarbon date, and Locus G, also largely Middle Woodland in age, also has elevated proportions of granite and quartz. Since different raw materials undoubtedly behave differently in fires, it is quite possible that some groups would have had preferences among the materials locally available.

Historic artifacts are infrequent in all loci except A, reflecting the distance between most of the prehistoric loci and the majority of the historic buildings at Shattuck Farm. Locus A was close to a historic summer cottage, and produced considerable material associated with this recent occupation. Thus, although the integrity of the Shattuck Farm site suffered considerably from historic activities, these activities were primarily subtractive and

disruptive, rather than additive.

Features were distributed over a considerable depth range at Shattuck Farm, although it must be remembered that most of those near the ground surface have been destroyed by plowing. It should also be noted that depth does not appear to be a good indicator of the absolute age of features for several reasons: prehistoric ground surfaces were not necessarily even, some features were constructed right on the surface while others were dug down into the soil to various depths, and land use and erosional processes of this historic period have affected each locus differently.

Table 48 indicates that feature frequencies are rather similar for most loci at Shattuck Farm. It is interesting to note that Locus G is unusually low in features according to the random sample, but very high ( $1.47/m^2$ ) when features per total sample is calculated. The features at this locus are primarily post molds and they are clustered; the random sample reflects the wider site area, and did not happen to include many postmolds. Table 56 shows feature frequencies by type, using the total samples, and this indicates that postmolds and red soil areas are the most abundant features. The only other notable pattern is that the loci on the alluvial terrace have proportionally more features than do the loci located on the remaining edges of the kame terrace. It is impossible to say whether the missing center of the kame terrace was also low in features.

Thus there are broad similarities in many materials over the entire Shattuck Farm site, but closer examination also reveals differences between loci. The two principle axes of variability appear to be the east versus the west end of the site, and the alluvial terrace versus the kame terrace. This pattern of variability reflects in part the different activities occurring in these areas, and also differences in the way the entire area was used by people of different time periods. This latter factor will be discussed further in Chapter 7.

Table 56. Prehistoric Feature Types by Locus (Total Sample)

Locus	Post-mold	Red Soil Area	Pit	Rock Platform	Rock Concentration	Earth Oven	Hearth	# of m <sup>2</sup>
A	-	2	1	1	-	-	-	11
B	-	1	-	-	-	-	1	8
C	-	-	1	-	1	-	-	7
D	7	1	-	2	-	1	-	13
E	1	-	1	-	1	-	-	4.5
G	19	2	1	-	1	-	-	15
H	-	-	-	-	-	-	-	7
Total	27	6	4	3	3	1	1	65.5

#### OTHER AREAS OF THE SHATTUCK FARM SITE

Prehistoric activities at Shattuck Farm were not restricted to the loci described thus far in this chapter. People used the entire site area, as well as adjoining areas, but we chose not to test the entire project area because some sections of it were very badly disturbed, and because it was evident that the material remains of prehistoric activities tended to be highly clustered. It is nevertheless important to discuss some of the areas not tested in the 1981 season, for the light they shed on the uses of the area as a whole. Data from the 1980 survey (Mahlstedt 1981), from collector interviews (Appendix I) and from our own surface finds can be synthesized to suggest some of the uses of areas outside our loci. Discussion of these areas will proceed from the river

inland, and generally from west to east.

The 1980 survey found prehistoric materials deep in two test pits on the ledge just at the edge of the Merrimack River. This area, designated the Wet Site or Locus F, produced debitage, fire cracked rock, three sherds, a scraper, the blade of a broken projectile point, and quantities of organic material including wood and pine needles (Mahlstedt 1981). The presence of the latter materials created considerable interest in this locus, although the excavators did express some uncertainty about whether the prehistoric materials were in primary or redeposited context. We were not able to resolve this issue during the 1981 season, as the Merrimack was unusually high because of modifications to the dam at Lawrence. In fact, we were treated to the sight of the Merrimack River apparently flowing west for several days while the water was being ponded behind that dam. Since the prehistoric materials had been found below the water table during the drier 1980 field season, these levels were even less accessible in the summer of 1981. We were also reluctant to test this locus because we did not have the facilities for preserving the water logged organic materials which might well be found.

In general, though, I am less sanguine than Mahlstedt was as to the likelihood that these materials are in primary context, and that the organic materials are of the same age as the lithic and ceramic artifacts. The prehistoric artifacts were found under the present water table at a depth of from one to 1.7 meters below the present ground surface of the ledge. The prehistoric level was overlain by a one meter thick deposit of leaves, wood, and silt containing nineteenth and twentieth century artifacts. This layer was presumably deposited as the river rose to its present level after the construction of the dam at Lawrence. However, the river itself must have risen more than one meter at the time of the construction of the dam, or else Peter's Falls would still be visible or close to the surface of the water. Gene Winter

estimates that the river actually rose eight to 10 feet (2.4 to three meters) and my own calculations of the amount the Merrimack would have been raised in this area by a dam 32 feet high (9.8 m) suggests that the rise should have been 2.5 meters or more. This would mean that if the prehistoric materials at Locus F were in primary context, they would have lain one to 1.5 meters above the original normal river level. This would have been well above the water table, and therefore these prehistoric levels would have been subjected to periodic cycles of flooding and drying. Under such conditions, uncarbonized organic materials should have been destroyed, as they were in the rest of the site loci.

I would suggest, rather, that these artifacts are indeed redeposited. When the water level of the river was raised abruptly at the time of the completion of the Lawrence dam in 1848, there is likely to have been a period of accelerated erosion until the river bank stabilized in its new configuration. Prehistoric artifacts today can be found in small quantities at the top of the present bank and down the slope to the river's edge (e.g. Locus E), and we can assume that during this period of accelerated erosion many such artifacts would have been eroded down the bank and deposited in and at the edge of the river. After this period of initial severe erosion the river bank should have stabilized, and erosion may even have been less than before the dam was built. The Lawrence dam would have resulted in a less steep river gradient in this area, while the dams upstream probably lessened the annual scouring with flood waters that had previously taken place. Thus, in the latter half of the nineteenth century the river may have begun aggrading, and depositing silt and recent debris along the edges of the river especially in locations on the inside of bends, as at Locus F.

Thus, the probability that Locus F is indeed a waterlogged prehistoric site in primary context seems slim, and there is every reason to believe that the lithics, the organic materials, or both are in secondary redeposited context.

Further testing would still be advisable to test this hypothesis, however.

Along the main alluvial terrace, the survey found an occasional flake or fire cracked rock at several locations, including one just at the far northwestern corner of the Hewlett-Packard fence and another just north of Locus B. It is possible that these remains represent the widely scattered residue from activities that took place all along the terrace, or they may be the edges of small concentrations, potentially other loci, missed by the survey.

As part of our 1981 investigations, we did some close interval testing that sheds light on the relationship between the major loci and at least one of these minor find spots. Locus G is essentially a peninsula bounded by the marsh to the north and east by the Valle's filtration bed (once the kame terrace) to the south. The survey suggested that the area of greatest density was toward the east end of this peninsula, but a preform and 3 flakes were also found in shovel test pits far to the west of this main area. For this reason, the entire peninsula was shown as a locus in Mahlstedt (1981:Figure 36a). In order to test the relationship between the main area and the peripheral finds, and thus to define the western boundary of the locus, we excavated a series of shovel test pits using the procedures described in Mahlstedt (1981). Starting at the north-south datum line for Locus G, we excavated shovel test pits at 10 meter intervals along six transects 10 meters apart running east and west. Other than three flakes and one fragment of fire cracked rock found in shovel test pits adjacent to our squares at Locus G, we found nothing but small fragments of slag and rusted metal until we reached the area in which prehistoric artifacts were found by the survey.

Here we excavated two normal one meter square test pits, N1W63 and N9W65. This area is outside of the limits of the flood deposits described for Locus G, and thus the stratigraphy includes 25 cm of dark brown (10YR 2/2) loam, orange (10YR 5/6) sandy loam for an additional 10 cm, and pale yellow (2.5YR 6/4) sand below

that. East/west plow scars indicate that the area was probably part of the same plowed field as Locus G. A number of non-diagnostic prehistoric artifacts were found in both squares, including four fragments of unidentified bone, one argillite biface, 55 flakes of grey felsite, seven quartz flakes, and six fragments of fire cracked rock. All artifacts were found in the plow zone. One feature was found, an area of reddened soil and charcoal fragments in the north wall of N1W63. It was 15 cm across and extended from the base of the plowzone, about 22 cm, to 37 cm in depth. Thus, this small area is probably typical of the small concentrations of prehistoric materials that surely exist in the open areas between the loci. They are probably small camps for very specific purposes, and therefore of archaeological interest. However, it should be noted that most, like this one, will be disturbed and will produce such low densities of material that age and activities cannot be determined.

Thus the alluvial terrace appears to have been heavily used all along the Shattuck Farm area. Heaviest concentrations of material are all located adjacent to secondary watercourses, however, and areas away from such locations are markedly less productive.

Further south, in the kame terrace area, Gene Winter and several of the collectors interviewed reported scattered finds from the area west of Spindle's Creek, but most of this area has since been impacted by the construction of the Hewlett-Packard plant. There are vague rumors of burials from this area, but no indications that major concentrations of prehistoric material were ever found there. I would suspect that many of the finds reported for this area may have been associated with the small creek that enters the Merrimack at Locus A. This watercourse is now impounded, but was originally a small stream that was partly ephemeral in its upper reaches.

East of Spindle's Creek lay the sandy kames that have since been bulldozed away. Loci C and H are peripheral remnants of this area, and may be somewhat

representative of the rest of the terrace. However, historic records cited in Chapter 3 indicate that Contact period and Late Archaic or Early Woodland burials were found in this section, and Ray Potvin has indicated that the site of the present Valle's filtration bed may have been especially productive of burials. Neither Locus C nor Locus H appear to have the total density of materials that appear to be indicated for the central section of the kame terrace, according to collectors' memories.

The section of the kame terrace immediately south of the Valle's filtration bed and the bulldozed area were tested during the 1980 survey with shovel test pits and by surface collecting. The eastern end of this area, known during the survey as the Spinach Field Site, produced large quantities of white porcelain buttons and kaolin pipe fragments, as well as some debitage, fire cracked rock, a biface, a fragment of soapstone bowl (Figure 3lc), a fragment of sturgeon bone, a broken side-notched point that could be a Brewerton or Meadowood type, and a late period ceramic sherd from an incised and collared vessel (Figure 32j). All these artifacts were found on the surface or in the plow zone, and no features were encountered in the shovel testpits. Thus we felt that context in this area had been largely destroyed by plowing, and we did not do further excavation in this area. Finds of prehistoric materials decline rapidly to the south of the filtration bed, suggesting that prehistoric use of this terrace was closely associated with the sandy kames, rather than with the gravely morainal soils further south. Thus, all we have left are the fringes of the kame terrace zone, and we can only extrapolate from them to the main area.

It is likely that occasional scatters of flakes could be encountered to the south of the area defined by our testing as the centers of occupation at Shattuck Farm. A good example might be the scatter encountered recently during testing for a proposed Interstate 93-River Road interchange, a little more than one klm south of the main site area (Shaw 1981). A small hill above an intermittent

stream draining into the marsh to the east of I-93 produced 41 flakes and a small quantity of charcoal and fire cracked rock. The excavators estimate that the concentration was only 10 to 15 in diameter, and they were not able to determine the age of the scatter. It was also impossible to be certain of what activities took place there, other than stone knapping. Similar scatters may exist on Shattuck Farm property inland from the river, probably in association with the many streams and springs that used to be found in the area.

## Chapter 6      FUNCTIONS AND INTERPRETATIONS

Many of the terms used in archaeological writing are simply traditionally accepted descriptive categories. For example, "projectile point", "hammerstone", and "gorget" are all conventional terms for objects of certain shapes or with certain general characteristics, and it would be a mistake to assume that all objects placed in one of these categories had necessarily been used in exactly the same way, or for the functions implied by the category name. However, when archaeologists wish to go beyond description to interpretation, then assumptions as to the actual functions of the objects or features must be made. Such assumptions are usually not made explicit in most site reports, which can mislead readers and hamper attempts to draw comparisons between sites. This chapter will attempt to clarify the assumptions being made about the uses of the various food remains, artifacts, and features found at Shattuck Farm, as a basis for the inferences to be made in Chapter 7 about the activities that took place at this site during the prehistoric period. The amount of discussion varies considerably among the categories of remains, depending largely on sample size. Little can be said about artifacts excavated in small numbers, but where sample size is greater, more discussion is possible. The categories themselves are deliberately broad, and correspond to standard archaeological usage. See Fowler (1963, 1966a) for illustrations of many of the categories discussed.

### ORGANIC MATERIALS

It is one of the ironies of archaeology that organic materials, which undoubtedly made up the most important component of the material culture of the people we study, also leave the least evidence at archaeological sites. We must constantly remind ourselves that the items we spend so much time excavating and analyzing are merely the relatively few imperishable materials

used by prehistoric people, and that most of the remains they left behind have perished. Materials derived from plants and animals were used in three major ways by prehistoric people. First and most obviously, they were used for food. Second, they provided fuel for fires. Third, they provided the raw material for a wide variety of manufactured goods, including tools, shelters, canoes, clothing, containers, adornments, etc.

### Plant Remains

The most abundant material of this type at Shattuck Farm was charcoal, which will be discussed later in this chapter in the section on features. No remains of wooden tools, basketry, or other items made from plants were found. Of plants used for food, little evidence was recovered in these excavations despite the use of flotation on all feature contents and on soil samples from the midden levels. It seems likely that most carbonized seeds have suffered mechanical destruction in the sandy, excessively drained soils. The one exception is nut shells, which are denser and thicker than other seeds and thus more readily preserved. There is ambiguity in their interpretation however, because they can be used for food, for fuel, or for both. Because the nut shells found in various loci at Shattuck Farm were generally all one type, I am inclined to assume that nuts were collected for food, and that their shells were then tossed in the fire for disposal and as a fuel. Nutshells collected from forest litter for fuel alone would be more likely to include several types, and fragment edges would be more worn and eroded than were those from this site. It is further assumed that the thick shelled nuts such as hickory and walnut, are over-represented in this assemblage relative to the thin shelled nuts, such as acorn and chestnut.

### Shell

Occasional mollusc shell fragments were found at Shattuck Farm, but most were too small to determine whether they represented fresh or salt water species.

There is a further complication in that historic farmers in New England commonly threw kitchen refuse on their fields for fertilizer, and thus all shell fragments in the plowzone could be of historic origin. Thus the presence of shell at the various loci was noted, but no further interpretations are drawn.

### Bone

Bone can be burned for fuel, but this is unlikely to have been done often at Shattuck Farm because alternative fuels were so readily available. Bone was also commonly used for tools, as excavations at sites with better bone preservation have shown (Luedtke 1980a, Ritchie 1969). At Shattuck Farm our excavations produced two tiny fragments of bone points that may have been parts of awls, projectile points, fish spears, or any other small pointed object. In addition, other collections from the site contain a bone awl, a bone harpoon, and a worked bone fragment (Appendix A).

Most of the bone at Shattuck Farm probably represents food remains, and the interpretation of these fragments is beset with many difficulties. Much has been written about the problems inherent in attempting to infer prehistoric diet from archaeological remains, and this issue will not be covered again here (see for example Dennell 1979). Instead I wish to consider two issues that are even more basic, and which are especially relevant to inland New England sites such as Shattuck Farm. These issues are differential species preservation, and differential species recognition.

All New England archaeologists are painfully aware that the New England bedrock, climate, and vegetation have conspired to produce very acid soils, and that preservation is consequently poor except in shell middens and in a few unusual inland sites (Jordan 1975). In addition, organic remains suffer considerable mechanical destruction from the repeated wetting and drying typical of New England weather, and as a result of the actions of soil

organisms such as worms. In general, the bone remains that survive are small fragments that have been calcined, or carbonized to just the right degree. Complete calcination leaves bone light and fragile, but "Before this stage is reached, the organic matter which it contains becomes charred, but, still filling the pores and spaces to some extent, holds the mineral constituents together. A burnt, but incompletely calcined, bone is often still fairly strong. Moreover, once carbonized, the organic fraction becomes exceedingly stable and resistant to chemical change, so that the additional strength conferred by charring is permanent." (Cornwall 1956:206).

Consequently, bone at inland New England sites has a great deal in common with plant remains at most archaeological sites; small fragments are the rule, and remains of different species have differential chances of being preserved depending on their shape and on the likelihood that they might fall into a fire and encounter the necessary reducing conditions. Thus, among plants nut shells usually have the best chance of being preserved because they are very thick and because they could be burned for fuel once the meats were removed. Pot herbs, on the other hand, have virtually no chance of being preserved because they are thin and composed mostly of water, and because they are generally eaten raw or boiled and thus have little chance of encountering the conditions necessary for carbonization.

Similarly, different species of animals were butchered and processed in ways that resulted in differential probabilities that their bones would be calcined. Large animals may have been partially butchered where they were killed, so that relatively few bones were even brought to the cooking location. Small animals would be brought back whole, so more of their bones would be discarded at the habitation site. Fish might be cooked after being boned and filleted at the water's edge, or they might be smoked whole on a rack, roasted on a stick over the fire, or boiled to mush in a pot, and each of these different

procedures would result in very different probabilities of the fishes' bones becoming calcined. For most of these procedures, the probability would be very low. On the other hand, turtles are likely to have often been roasted in their shells, so there is a very high probability that fragments of their shells would become calcined. Finally, thin bones and porous bones, such as those of birds and fish, respectively, have a high ratio of surface area to volume. They thus offer more surface for acids to work on and are much less resistant to chemical destruction than are thicker, denser bones.

For all these reasons, the bones recovered at sites such as Shattuck Farm are not likely to be very representative of the animals actually eaten there. The second issue, species recognition, is partially related to the first, in that some animals are more easily identified in the small fragments resulting from the preservation conditions described above. For example, sturgeon scutes and turtle shell are recognizable in fragments as small as 5mm across. Most bird and fish bones are recognizable as such in small fragments, though finer discrimination is often impossible. However, mammal and reptile bones are not easily distinguished in small fragments.

Small animals are considerably easier to identify than large ones, simply because small fragments of the former are more likely to include diagnostic articular surfaces. For example, if a deer skeleton were to be broken up into fragments no bigger than 1 cm across, very few of the resulting fragments would include features that would allow an identification of deer. If a squirrel skeleton were broken up into similar sized fragments, however, a larger proportion of them would be identifiable as squirrel.

In general, then, many factors work against the identification of large animals at inland habitation sites. Their bones may not even have been brought to the habitation site, the bones that were brought might have been smashed to obtain the marrow, and the small fragments that survived chemical and

mechanical destruction are unlikely to be identifiable. Thus, it should not be surprising that deer was not identified at Shattuck Farm, although this animal was a major meat source for prehistoric cultures throughout the eastern Woodlands and is virtually ubiquitous at archaeological sites with decent bone preservation.

Because of the factors discussed here, the bone data in Chapter 5 are assumed to be biased in favor of species recognizable in small fragments, and in favor of species processed in such a way that their hard parts were likely to fall into fires. Because of these biases and because of the limited samples for most loci, very little attempt will be made to discuss diet or to draw many conclusions from the bone data produced by the Shattuck Farm site. In Chapter 7 these data are used primarily to determine the seasonality of different occupations.

## CERAMICS

Ceramics can be dealt with in considerably more detail than the other types of remains because the sample from Shattuck Farm is so much larger. Ceramics are also of perpetual interest to archaeologists because they can produce a rich variety of kinds of information. As technological tools, they can provide information relevant to diet and economy (Braun 1983). As products of a relatively complex manufacturing process, they can produce data relevant to procurement practices, territory size and boundaries, and manufacturing processes and traditions (Kenyon 1979). As communication devices, some of their variability is relevant to the study of social organization and inter/intra group relationships (e.g. Braun 1977, Whallon 1968). Some ceramic attributes are related to only one of these dimensions, while others may reflect several different cultural aspects. In order to deal effectively with questions

relevant to different cultural subsystems, it is important to select the most appropriate ceramic attributes for each particular study.

One approach to determining attribute appropriateness is to consider the sherds found in a site as the end result of a long series of decisions about pottery manufacture, use, and disposal. There are many decision points in this process, and a number of options at each point, although options are limited to some extent by the previous decisions and by physical laws (C.f. Bonnicksen 1977). Beyond this, the decisions are affected by many other characteristics of the society within which the pots are being made (Matson 1965), and consideration of the ways in which these characteristics affect ceramic production may shed light on the problem of which ceramic attributes are most relevant to which other aspect of culture.

To implement this approach, this analysis will begin with a brief survey of the "life" of a ceramic vessel, focussing on the points where decisions must be made and examining the options available at each point. Options clearly irrelevant to prehistoric New England, such as the use of glazes or the wheel, will not be mentioned. This summary cannot begin to encompass the full complexity of ceramic manufacture, and the reader is referred to Shepard (1956), Rye (1981) and others for more detailed information on most of the stages of ceramic manufacture to be discussed here. After this brief survey of ceramic manufacture, the discussion will then go through the same general sequence using archaeological data from Shattuck Farm, from other sites in southern New England, and from historical records in order to determine which decisions were actually made by prehistoric New England ceramists, and how these decisions changed over time.

#### Ceramic manufacture

Ceramic vessels are part of the larger category of "containers", and most societies have numerous things that must be contained, as well as numerous options for containing. Primary functions for containers would include cooking,

serving, processing, and storing foods and liquids, as well as transporting and storing foods, liquids, and other goods. Containers may also function solely as decorations or as symbols, but these uses are minor and probably not important for New England. Ceramic vessels could be used for all of the above functions, but alternative containers would include wooden boxes or bowls, bark containers, baskets, bags, stone vessels, gourds, animal skins or bladders, and facilities such as pits or cribs. The reasons why specific containers are chosen for specific functions within a society must depend on many factors, but degree of sedentism is especially important. Ceramic vessels function very well for all the functions listed above, but they do have the disadvantage of being heavier, less flexible, and more breakable than most of the other options, and thus are disadvantageous if settlements are moved frequently and pack animals are not available. Ceramic vessels may also take more labor to make than many of the alternative containers, and the failure rate during manufacture is certainly higher for ceramics. Thus ceramic vessels are "expensive" in comparison to the other options, and one would expect non-sedentary cultures to use ceramic vessels only for tasks for which their advantages clearly outweigh their disadvantages.

The decision as to which function or functions ceramic vessels will fulfill has logical priority in the processes under discussion because that decision structures many subsequent decisions as to how the vessel will be made. Basically, the ceramist's problem is to create a vessel that will first survive the manufacturing process itself, and which will then have the appropriate size, shape, permeability, strength, and resistance to thermal and mechanical stress to fulfill its intended function or functions properly (Braun 1983). In doing this, the ceramist must often balance desirable and undesirable properties against one another. For example, an increase in the rate of heat diffusion can be achieved by decreasing the thickness of vessel walls, but this will also

make the vessel more fragile and liable to fracture during use. Thus any vessel is the result of a series of compromises, influenced by the ceramist's judgement as to which properties are most important given the intended function of the vessel.

The first step in the manufacturing process is the acquisition of the raw materials, primarily the clay and tempering material. These may be obtained locally or may have to be brought from a distance, depending on their natural occurrence and on any special requirements the ceramist may have. If the ceramist wants clay that will fire to a particular color or that has any other special property, it may be necessary to look further afield than if specifications are less stringent. Clays may also have to be blended to improve their working properties (Arnold 1971). Once the clay is dug it may be pre-processed to remove impurities by hand-cleaning, settling in water, drying and crushing, sifting, etc. (Shepard 1956). The amount of pre-processing that is done will depend on the original purity of the clay and the degree of homogeneity desired by the ceramist.

Next, temper must be acquired and prepared. Temper is nonplastic material added to clay to improve the workability of the wet clay, and to counteract pure clay's tendency to shrink during drying and to crack during firing (Shepard 1956). Crushed rock, sand, bone, shell, pottery, or organic fibers can all function as temper. Each of these materials has different properties, however, and this makes the study of tempering choices especially interesting. The addition of any temper weakens the vessel body, but it also opens the texture of the clay, making it less sticky and easier to work and allowing water to escape. Too much or too little temper will make the vessel liable to fracture, and the type of temper matters also. Clay bonds better to rough than to smooth surfaces, so a vessel will be stronger if temper fragments are rough (Shepard 1956). Platy materials such as shell can be made to align with the walls of the vessel,

which will strengthen the walls in one direction and weaken them in the other. Different tempering materials react differently to heating, too, with some decomposing (Rye 1976). Others have rates of expansion during heating that vary considerably from that of the clay, and this will cause cracking and spalling. Finally, Shepard points out that "The potter was concerned with the effect of temper on ease of finishing the vessel surface as well as with the effect on strength. In fact, the selection of temper may have been made most often on the basis of texture." (Shepard 1956:26).

Thus the ceramist is faced with a constellation of decisions as to the type of temper to use, how to prepare it, how finely to crush it, and how much to add. The next step is straightforward, though; the temper is mixed in thoroughly and then the clay is "wedged", or pounded and kneaded to remove air.

Next the vessel is formed, using pinching, coiling, slab construction, paddle and anvil, or a combination of these techniques. All these procedures can give very similar results, and differences show up primarily in fracture, when breakage may occur along seams. Selection of a particular manufacturing technique is usually a basic and conservative aspect of any ceramic tradition, but the functional implications of the different procedures have not really been investigated. For all techniques there is usually additional pounding of the walls to remove air, weld seams shut, or align fragments of temper. Walls may also be scraped to achieve the desired thickness and smoothness.

Vessel form and size are also partly based on tradition, but in addition these shape attributes are related to function, and to how the vessel will be carried, stored, transported, and suspended or set on a fire. There are some general shape parameters set by function. For example, a serving vessel must be broad and open (though it may have a separate cover), while a water storage vessel should have a small opening to reduce evaporation from the mouth. A cooking vessel must have a mouth wide enough to allow the food in and out

easily, but some constriction of the mouth would encourage rapid heating of the contents. Methods of handling or suspending the vessel may also determine whether neck, handles, lugs, or other protruberances are added.

The next step is to finish the surface of the vessel by either roughening or smoothing; the vessel may then be decorated by stamping, poking, impressing, incising, or by adding strips, nodes, or appliques. Full discussion of the meaning and function of decoration on ceramics is beyond the scope of this work (see Braun 1977 and 1983, Wobst 1977, and Plog 1980). It is simply assumed here that the process of decoration involves a hierarchy of decisions about the design elements, their shape, size, spacing, and orientation, the ways in which they are combined into design motifs, and the over-all design symmetry and placement. The design on a vessel is thus a complex "message" transmitting information about group affiliation and perhaps also about vessel function or ownership. It is also assumed that the different levels or aspects of the decorative process may change at different rates, in response to different social pressures.

After the vessel is formed and decorated it must be allowed to dry thoroughly; otherwise, water remaining in cracks and pores of the vessel will turn to steam when the vessel is fired and cause the vessel to shatter. Drying times varying from hours to weeks have been recorded (Shepard 1956:74), and the length of time necessary appears to depend on the type of clay and the type and quantity of temper, as well as on local weather conditions including temperature, wind speed, and humidity. Drying may be hastened by placing a vessel near a fire or may be slowed by placing the vessel under cover in a cool place (Shepard 1956). When a vessel is dry or very nearly dry, it may be burnished by rubbing the surface with a hard object such as a pebble.

Next the ceramic vessel is fired, and here again the ceramist is faced with a wide variety of options and possibilities. Crucial variables in the

firing process include the temperature of the fire, the duration of firing, the rapidity with which the vessel is heated and cooled, and the amount of oxygen which is allowed to reach the vessel. These factors affect the degree to which the clay minerals undergo recrystallization and the extent to which the tempering material is altered, and thus the hardness, permeability, and color of the finished vessel. Firing is also the step in the manufacturing process at which irreversible breakage is most likely to occur. Karen Vitelli has experimented with the manufacture of earthenware pottery similar to that being studied here, and she suggests that breakage rates of 25% to 50% are not out of line for vessels fired on an open fire (Karen Vitelli, personal communication).

A final set of decisions have to do with how the vessel is actually used: how it is put on and taken off the fire, how it is carried, how often it is used, how it is cleaned between uses, etc. These aspects of use will affect the breakage rates and also the kinds of fractures and alterations of the vessel which might occur. Decisions must also be made as to when the vessel is broken enough to be discarded, and what will then be done with it. Are pots with chipped rims discarded, or must breakage be more serious than that? Under what circumstances might a vessel be repaired rather than discarded? Are vessel fragments ever recycled into scoops, pendants, or other items? Are vessels ever broken intentionally, perhaps in the course of a ceremony or ritual act? Are broken vessels swept from the living areas, left where they fall, buried in pits, or included in burials? All of these factors affect the use life of vessels, as well as the context of their recovery by archaeologists.

A separate issue affecting some of the decisions discussed above is the socioeconomic aspect of ceramic manufacture, including the issues of who makes ceramics and how pottery manufacture articulates with other aspects of the economy and society. Ethnographically, ceramic manufacture can be either men's or women's work (Matson 1965). Ceramics may be made by specialists or

by everyone of the appropriate age and sex. They may be made in the home or at special workshop locations. Decisions in these matters will affect how often vessels are made, when they are made, and how they are distributed to the people who use them.

The last series of options to be discussed here involve the recruitment of ceramists, or the ways in which individuals are trained to become pot makers. Two polar models for training would appear to be likely, each with distinct archaeological implications. The first, here called the "playing house" model, assumes that novices practice making pots on their own or with an adult practitioner nearby to give aid and advice. The archaeological result of this should be many poorly made practice pots, as individuals would gradually learn the necessary skills with considerable trial and error. A second model, called here the "apprentice" model, assumes that novices work along with skilled practitioners, doing only one step at a time in the entire process until each is mastered. Novices would not be making complete vessels on their own until all the intermediate steps has been learned, and the result should be very few inexpertly made pots at archaeological sites. Of course, a range between these two behavioral poles is also possible, and would result in varying numbers of practice pots at sites.

#### Ceramic manufacture at Shattuck Farm

The above discussion would seem to indicate a bewildering variety of possibilities for prehistoric New England ceramists. In reality, however, New England ceramists operated within the bounds of a rather conservative manufacturing tradition, and spatial and temporal variability is comparatively subtle (Kenyon 1979). Variability does exist, however, and many aspects of change over time can be demonstrated with the Shattuck Farm ceramics, which are well suited to such a discussion because they cover the entire ceramic period from its beginning in the Early Woodland to its end during the Contact period.

There may be minor gaps in the sequence, but no major gaps are discernible at this time. Although ceramic data from elsewhere in New England will also be referred to at times in the following discussion, it should be emphasized that this analysis is intended to refer primarily to this one site. It is assumed that ceramic sequences may vary considerably between regions, and that conclusions drawn for this area are yet to be tested elsewhere in New England.

Since much of the following discussion will deal with variation over time, it is important to discuss the basic ceramic chronology to be used here. Fairly detailed ceramic chronologies and typologies exist for upstate New York and for the Long Island Sound area, but these are not directly applicable to Massachusetts. A very general chronology has been developed for Massachusetts ceramics (Fowler 1966a, Dincauze 1975), with major divisions roughly comparable to those found in neighboring regions, and these major divisions are the ones to be used here. In addition, dated ceramic styles from some nearby sites are used to "anchor" segments of the Shattuck Farm sequence more precisely in time. In all cases, only surface decoration is used in assigning vessels to the sequence used here. All other attributes of shape, temper, thickness, rim form, etc. are considered independent variables for the purposes of this analysis. However, these variables will be used to define some of the chronological subdivisions to be suggested later in this analysis.

Thus it is assumed that vessels with cordmarking on both their inner and outer surfaces are earliest and date to the Early Woodland period, by analogy with ceramics in New York state (Ritchie 1980) and throughout the Northeast. This major division corresponds to Fowler's Stage 1 (Fowler 1966a:51-53). Some very thick ceramics with smooth surfaces may also date to this time period (Barber 1979:38) but these cannot be discerned using the criteria defined above. Ceramics decorated with rocker stamping and dentate stamping have been securely dated to the Middle Woodland at the Wheeler's site (Barber 1982) and elsewhere

in New England, and these correspond to Fowler's Stage 2 ceramics (Fowler 1966a: 54-56). Ceramics with cordwrapped stick impressions, linear stamping, and incising as dominant decorative elements have been dated to the Late Woodland period at the Calf Island site (Luedtke 1980a) and elsewhere in New England, and this division corresponds to Fowler's Stage 3 (Fowler 1966a:56-58). Finally, Fowler defines a Stage 4 (Fowler 1966a:59-61) dated essentially to the Contact period and characterized primarily by changes in vessel shape. Thin walls, globular shape, markedly constricted necks, and the appearance of collars and castellations are all typical of this Stage, and they are strongly reminiscent of Iroquoian styles from New York. However, by the strict criteria on surface decoration to be used here, they are distinguished primarily by their complex incised designs and by appliqued figures of plant, animal, and human form. Suggested subdivisions within some of these broad divisions will be discussed later in this analysis.

This study of ceramic manufacture in prehistoric Massachusetts can now begin with the issue of vessel function. Table 57, compiled from early historic writings for the region, indicates that ceramic vessels were used almost exclusively to cook food during the Contact period. There are also references to boiling the oil from nuts (Josselyn 1672:48) and to boiling medicines (Williams 1973:243, Josselyn 1972). It is very likely that these activities also involved earthenware vessels, since boiling is not easily done in any of the other containers listed here. For other containment functions, southern New England Indians used a wide variety of organic containers, which makes eminent sense in the context of cultures that still made regular seasonal moves of residence. Bulky, fragile ceramic pots had major advantages for cooking, but for other containment functions their disadvantages were salient and alternatives were used.

It is very likely that ceramic vessels served the same basic function in

Table 57. Containers in Contact Period New England

Reference	Cooking Food	Serving Food	Transport	Oil Containers	Water Transport	Corn Storage	Miscellaneous Storage
Champlain 1907:74	earthen pots					grass sacks in pits	
Mourt 1963: 22, 26, 34, 65			baskets	"bottles"	"bottles"	baskets in pits	acorns in baskets, beans in bags
Bradford 1966:389		wooden trays and dishes					
Wood 1977: 81, 86, 87 113, 114	earthen pots		baskets, corn meal in leather bags			bark-lined pits	
Josselyn 1972:49; 1674:72, 138, 142, 143		wooden trays, dishes and spoons; birch bark cups and dishes	bags	bladders	birch bark buckets		birch bark boxes
Morton 1883: 41, 42	earthen pots	wooden bowls				pits lined with mats and baskets	
Williams 1973:100, 121, 243			corn meal in little baskets or leather pouches				household goods stored in baskets, hemp bags, or sacks
Gookin 1792:11	earthen pots	wooden spoons, ladles, and dishes			birch bark pails		rush and maize husk baskets, and birch bark containers

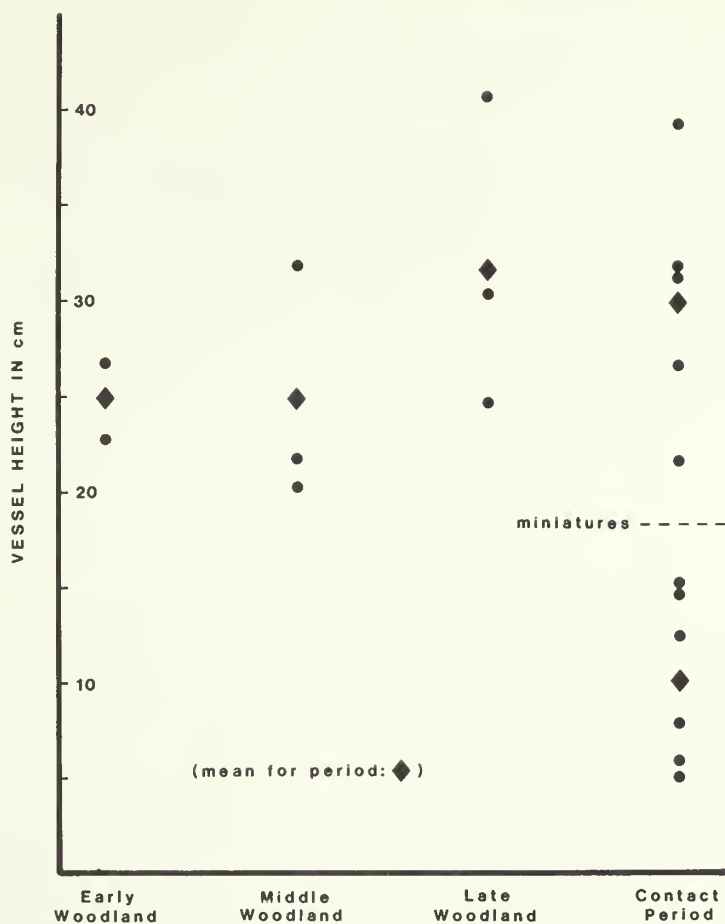


Figure 33. Vessel Height Through Time.

the prehistoric period as well, as there is no reason to believe that cultures were more sedentary during any of the earlier ceramic periods. If anything, the data indicate a trend toward greater differentiation in the later periods, if variation in size can be taken as an indicator of functional variability. Morton states that ceramic pots varied in capacity from "one quart to a gallon, 2 or 3" (Morton 1883: 159), and a survey of size data in the available literature on whole or reconstructed vessels also suggests more size variation in the later periods (Figure 33 and Table 58). If the smaller pots are removed from the analysis, vessel size can be seen to be relatively constant through time, and over-all proportions are also remarkably constant, with vessel height very nearly equal to maximum vessel diameter in all periods. This constancy of vessel size and proportion is certainly consistent with an interpretation of constancy in general vessel function.

The small vessels so common in the Contact period are very likely to have

Table 58. Vessel Proportions Through Time (in cm)

Period	Vessel #	Height	Maximum Diameter	Mouth Diameter	Maximum d/ht	Reference
Early Woodland	1	22.9	25.4	25.4	1.11	Fowler 1952
	2	26.7	22.9	22.9	.86	Fowler 1952
	Mean	24.8	24.2	24.2	.99	
Middle Woodland	3	25.4	29.2	26.7	1.15	Fowler 1965
	4	21.7	25.4	24.1	1.17	Fowler 1965
	5	20.3	19.0	17.8	.94	Scothorne 1971
	6	31.8	31.8	30.5	1.00	Whiting 1949
	Mean	24.8	26.4	24.8	1.06	
Late Woodland	7	40.6	37.3	30.5	.92	Viera 1962
	8	30.5	27.9	20.3	.91	Dodge 1962
	9	24.6	26.2	19.0	1.06	Bielski 1962
	Mean	31.9	30.5	23.3	.96	
Contact Period (large vessels)	10	39.4	30.5	26.7	.77	Brewer 1961
	11	31.8	22.9	20.3	.72	Johnson 1962
	12	31.3	27.9	26.7	.89	Dodge 1962
	13	29.2	25.4	25.4	.87	Greene 1961
	14	26.7	22.9	20.0	.86	Hadlock 1949
	15	21.7	15.2	15.2	.70	Johnson 1962
	Mean	30.1	24.1	22.4	.80	
Contact Period (mini-atures)	16	15.0	13.0	10.0	.87	Robbins 1959
	17	14.8	11.8	11.8	.80	Vidal 1950
	18	12.7	12.7	12.7	1.00	Fowler 1974
	19	12.7	20.3	15.9	1.60	Bielski 1962
	20	10.2	10.2	10.2	1.00	Fowler 1974
	21	8.0	7.6	7.8	.95	Hadlock 1949
	22	5.1	4.8	5.1	.94	Fowler 1974
	23	5.0	3.0	3.0	.60	Mrozowski 1980
	Mean	10.4	10.4	9.6	.97	

served a different function than the other larger vessels. These small vessels will be referred to here as "miniatures", and will be defined operationally as those 15 cm in height and under, as there is an apparent break in the distribution of vessel heights at about this point (Table 58). Four general functions have been suggested for miniature vessels. They may have been "practice pots" made

by novices learning to make ceramics (c.f. Wright 1974); they may have been toys, made by adults for children to play with; they may have been containers for storing condiments and herbs (Mrozowski 1980); or they may have been vessels for the preparation of special foods used in small quantities, such as medicines or baby foods. These functions are not necessarily mutually exclusive, but they do have different archaeological test implications as to how vessels will have been made and where they will be found. These expectations can be examined with available data from southern New England.

If miniatures were practice pots, we should expect them to be very abundant at sites where pottery was manufactured because ceramic manufacture is a skill that requires considerable practice and because the breakage rate can be expected to be especially high during the learning process. Most practice pots should be simple and crudely made, and most would not show signs of being used because they would have broken during manufacture. They might be found in the graves of the children who made them, but this would be unlikely if grave goods consist primarily of utilitarian and valuable objects presumably needed in the afterworld, as seems to have been the case during the Contact period in New England (Simmons 1970).

If miniature pots were toys, then they would be likely to be simple but not necessarily crude or clumsy because they were made by skilled potters. They should be far less common in middens than would "practice pots", but they would be moderately common because earthenware pots would probably break rather easily during play. It is unlikely that they would show signs of use. They could be found in the graves of children, along with other toys or personal possessions.

If miniatures were used as condiment containers, they should be as carefully made as full-sized pots. They should also be very uncommon in middens because they would not normally receive hard usage and should have

a long use life. There is no reason to expect them to appear in graves.

If miniature vessels were used for "special foods" they should be relatively carefully made and should not be abundant in middens, because they would be carefully curated. They should show signs of having been used on fires, however. They might easily be found in graves of both adults and children, as they are likely to have been used immediately before death, and would be likely to be needed in the afterworld.

Some data on the attributes and distributions of miniature vessels are available in the literature. While I have not personally examined the vessels in most cases, illustrations suggest that most were carefully made or at least carefully decorated. Miniature vessels from sites I have excavated, including Shattuck Farm, range from simple pinch pots to delicate, thin-walled, carefully made vessels (Luedtke 1980a). On the whole, the ones I have seen do not appear to have been made by children. As for the context of recovery, miniature vessels do not appear to be common in sites, but they may well be under-represented in site reports because they are difficult to spot. I have never identified a miniature vessel in the field, and have often missed them during the washing and initial analysis phases. Most have been identified as miniatures during the phase of analysis involving detailed inspection and measurement. Both the form and relative scarcity of miniature vessels in middens argues against the practice pot and toy hypotheses.

Most of the miniature vessels in the literature were found in graves, which argues against the condiment hypothesis, and Table 59 shows data on miniatures found in graves where the age of the associated burial could be determined. While many of the graves in the sample are indeed children's graves, in the majority of cases the associated human remains were either too old or too young for either the toy or the practice pot hypotheses to be supported. Only Simmons discusses signs of use, and all three of the miniature

Table 59. Miniature Vessels from Graves in  
Massachusetts and Rhode Island

Burial	Vessel Height	Age of Body	Other Artifacts in Grave	Reference
Wapanucket Burial #2	15.0	adult	glass beads, copper spoon	Robbins 1959
West Ferry Burial #16	15.0	4-5 year old child	brass spoon, clay balls	Simmons 1970
Hyannis	14.8	7 mo. fetus, 3 adults a few meters away	none	Vidal et.al. 1950
Taylor Farm Burial #1	12.7, 5.1	adult	copper kettle, stone pestle, 2 iron hoes, glass beads, mirror, scissors, buttons	Taylor 1982
West Ferry Burial #17	12.5	6-8 year old child	none	Simmons 1970
West Ferry Burial #6	12.3	infant, less than 4 years	brass spoons	Simmons 1970
Taylor Farm Burial #5	10.2	infant	glass and shell beads	Taylor 1982

vessels he reports showed signs of having been used on fires (Simmons 1970).

The only hypothesis not ruled out by the discussion thus far is the "special foods" hypothesis, and this hypothesis is supported by three other facts as well. First, while ethnographic records make no specific mention of the use of herbs or condiments, they do mention that herbal medicines were boiled, and that bark was also boiled in water before it was applied to wounds (Josselyn 1674, 1972). While such procedures could have been done in the family cooking pot, this seems unlikely because porous earthenware absorbs flavors so readily. Surely people would have preferred to keep the tastes of food and of medicine separate.

Second, if miniatures were indeed used for special foods, one would expect

them to become more common during the Contact period, when disease was so prevalent among the native populations of New England, and this is exactly what appears to have happened. Finally, the "special foods" hypothesis would explain why miniatures persisted into periods when earthen cooking vessels were generally being replaced by metal kettles. Vessels used in the preparation of medicine are not strictly utilitarian items in most societies, but are part of healing systems with many highly traditional and spiritual components. Considerable conservatism would be expected, then, in any activity having to do with healing.

Thus, I would argue that miniature vessels in Massachusetts were used for preparing special foods, in particular medicines, and perhaps infant foods as well. I do not argue that this was necessarily the case elsewhere in the Northeast, as miniatures may have had entirely different functions in other societies (c.f. Wright 1974).

If full-size ceramic vessels in New England were used primarily for cooking, then resistance to thermal stress should have been an important factor in deciding which raw materials were to be used. This may have ruled out some clay types, but New England in general is rich in clays, as would be expected for a glaciated region with abundant rivers and lakes as well as a long coastline. Kenyon states that there are clay deposits at many locations along the Merrimack (Kenyon 1979), and Abbot states that clay deposits existed in the Andover area (Abbot 1829). As discussed in Chapter 2, clay may even have been available in the immediate vicinity of Shattuck Farm.

This ubiquity of clay sources would seem to contradict Gookin, who states that, "The pots they seeth their food in, which were heretofore, and yet are, in use among some of them, are made of clay or earth, almost in the form of an egg, the top taken off, but now they generally get kettles of brass, copper, or iron. These they find more lasting than those made of clay, which were

subject to be broken; and the clay or earth they were made of was scarce and dear." (Gookin 1792:11). Gookin's informants may have been referring to the very finest clay sources, which might indeed be scarce and which may have occurred in the form of small lenses or pockets that could be easily exhausted. However, these statements could also have been a rationalization for the gradual abandonment of clay vessel manufacture. Metal kettles began to replace pots even before Europeans settled in New England, although ceramic vessels of good quality were still being made as late as 1664 (Thomas 1979).

The ceramics at Shattuck Farm appear to have been made of clays from more than one source, judging from the variations in color and in accidental inclusions such as sand grains, mica flakes, iron particles, and heavy mineral fragments. Detailed thin section or trace element studies would be needed in order to say how many sources are represented in this assemblage, or where they were located.

It would seem reasonable to assume that most clay was obtained close to wherever people spent the pottery making season, which would have been the warmer and drier months of the year. Trade in raw clay is rather unlikely because it is bulky and very heavy, and there is no evidence suggesting that specific aesthetic or technological properties were valued enough to warrant importing clay (Kenyon 1979).

Preprocessing of clay also appears to have been minimal. Occasional casts of reed or grass leaves probably represent basket fragments, or the materials in which the clay was wrapped for transport from the source to where it was to be worked, and their presence suggests that clay was not carefully cleaned. In general, New England prehistoric ceramists appear to have had broad or flexible requirements for clay quality.

Tempering materials used by the ceramists at Shattuck Farm include grit, shell, and occasionally both. I saw no fiber tempered sherds, and Bullen's

report of such sherds in the area was based on misidentification of the cavities left by shell leached out by acids in the soils (Bullen 1949). Grit or mineral temper was used for a minimum of 76 vessels in the Shattuck Farm excavated sample, and these sherds usually contain distinct combinations of minerals such as mica, feldspar, quartz, etc. Some combinations appear to be the same as those observed in the granites found among the fire cracked rocks at the site, and others may represent quartzes and diorites. I saw no sign of the use of Merrimack Quartzite, the predominant rock type in the area, or of use of felsite as temper. The distinctive mineral suites observed in some sherds suggest that potters were selecting a pebble or cobble of appropriate size from among the fire cracked rocks, crushing it, and adding it to the clay. Fire cracked rock is already fractured internally, and is thus easier to crush; it has a further advantage in that any minerals liable to decompose or expand upon firing have already done so. Since rock types from many regions are available in the glacial gravels near Shattuck Farm, temper type is probably not a good indicator of the territory of the potter.

There is a general decrease in the size of grit temper particles through time, with very coarse fragments common in the Early Woodland vessels, and coarse to medium fragments in the Middle Woodland and some of the early Late Woodland vessels. Later Late Woodland vessels have quite fine temper (Dincauze and Gramly 1973), possibly because temper was crushed more carefully and thoroughly. However, it is also likely that temper was being sifted through baskets during this period, as was corn meal (Gookin 1792:10), in order to obtain fine and uniform fragments.

Shell temper was used for at least 51 vessels in the excavated sample from Shattuck Farm, and three vessels appear to have both shell and grit temper. These latter sherds were all very small though, and I could not rule out the possibility that they actually belonged to either the shell or grit category.

The number of shell tempered vessels is undoubtedly too low, as it is, because the very presence of the various types of grit temper allowed finer discrimination of individual vessels. Table 60 demonstrates this problem. Shell tempered sherds make up a greater percentage of the total sherds from Shattuck Farm by both number and weight than they do by vessel lot. Also, over twice as many sherds were assigned to each shell tempered vessel, on the average, than to each grit tempered vessel lot. In other words, it is very likely that shell tempered vessels were sometimes combined in this analysis, and that more vessels are actually represented in the assemblage than I was able to discriminate.

Variation in the size of shell temper fragments was more difficult to discern than for grit perhaps because shell was not used here over as long a time span as was grit temper. For both temper types, the density of temper probably changed, as did the evenness of its distribution through the clay body, but sensitive methods such as radiographic analysis will be necessary before these changes can be properly quantified (Braum 1982).

Table 61 shows the distribution of vessels of specific temper types by style of decoration, omitting vessels represented by only smooth or cordmarked sherds. There is a fairly clear association between decoration type and temper type and size, and it is obvious that choices for tempering materials changed over time in this area. Early Woodland vessels at Shattuck Farm have only grit temper, and vessels with Middle Woodland decorative elements are predominantly grit tempered. Vessels with Late Woodland motifs have either shell or fine grit temper, and Bullen's data from the Foster's Cove site suggest that the fine grit tempered pottery is somewhat later in time than the shell tempered pottery in this region. However, it is also possible to interpret the stratigraphic relationship between these types to mean that both were used simultaneously during the later part of the Late Woodland (Bullen 1949:29). Ceramics with fine shell temper and incised, linear stamped, and cordwrapped stick impressed

Table 60. Shell and Grit Tempered Vessel Proportions at Shattuck Farm

Temper	# of Vessels	% of all Vessels	# of Sherds	% of all Sherds	Weight of Sherds, in Grams	% of total Sherd Weight	Average Weight/ Sherd	Average Sherds/ Vessel
Shell	51	41.1%	1488	61.2%	536.8	44.0%	.36	29.2
Grit*	73	58.9%	944	38.8%	682.8	56.0%	.72	12.9
Total	124	100.0%	2432	100.0%	1219.0	100.0%	.50	19.6

\* Note - The figures for grit tempered vessels do not include 3 vessels (G7, G8 and H15) represented by over 400 sherds each. No other vessel lot from Shattuck Farm had more than 100 sherds assigned to it, and thus these three cases would have skewed this table considerably.

Table 61. Decoration by Temper for Shattuck Farm Vessels

Decoration	Coarse Grit	Medium Grit	Shell	Fine Grit	Total Vessels
Interior and Exterior Cordmarking	6 (100%)				6
Rocker Stamped		5 (16%)			5
Comb Impressed		6 (19%)			6
Noded		1 (3%)			1
Net Impressed		1 (3%)			1
Dentate Stamped		14 (45%)	1 (3%)		15
Scallop Impressed		1 (3%)	2 (7%)		3
Reed Impressed		1 (3%)	4 (14%)		5
Linear Stamped		1 (3%)	4 (14%)	1 (14%)	6
Incised		1 (3%)	7 (24%)	1 (14%)	9
Cordwrapped Stick Impressed			7 (24%)	2 (29%)	9
Cord Impressed			2 (7%)	1 (14%)	3
Fine Cordmarked			2 (7%)	2 (29%)	4
Total	6 (100%)	31 (100%)	29 (100%)	7 (100%)	73

decoration are dated to about AD 1350 at the Calf Island site in Boston Harbor (Luedtke 1980a), suggesting a similar age for the fine grit tempered ceramics at Shattuck Farm. None of the very late "Iroquoian" styles of decoration were found in the excavated sample from Shattuck Farm, although some are known from the surface collection, and these latter have fine grit temper.

This trend toward the use of shell temper in the later Woodland periods has been observed elsewhere in southern New England (Dincauze 1975), although it may not be universally found. The phenomenon has not been satisfactorily explained. Snow has argued that the shift occurred because people were resident on the coasts during the season of pottery manufacture, but this argument ignores the fact that grit, especially in the form of fire cracked rock, is just as readily available on the coast as it is inland. Use of shell temper is also not a simple matter of substituting one available material for another. Shell has very different properties from grit as a tempering material. When shell is heated above about 750° C, the calcium carbonate decomposes to carbon dioxide and calcium oxide, thus causing problems during firing and also afterwards, when the calcium oxide hydrates and expands, causing fragments of the vessel to spall off. To quote Rye, "Changes in materials can be made relatively easily if the properties are similar, but substituting materials with distinct behaviors will require altering the entire manufacturing process. For example, a successful change from quartz temper to beach sand containing shell would necessitate considerable experimentation with new firing techniques. Changing the approach removes the subtleties of control the potter has developed and a long period will ensue before an equivalent level can be reestablished" (Rye 1981:5). Thus a switch to shell temper is evidently not a minor change, and it seems unlikely that the same potter would switch back and forth between the two types of temper. However, both types might be used by different

individuals within the same group, as variation in raw material preferences is a common phenomenon among those who perform crafts.

Shell does have several advantages that makes it desirable as a tempering material, however. First, the thermal expansion rate of shell is very similar to that of clay at temperatures up to about 600°C, the maximum temperature of a cooking fire. This means that shell tempered vessels will have better resistance to thermal shock than will those tempered with quartz, which expands at a faster rate than clay and undergoes a crystalline inversion at 573°C (Rye 1981:34). Also, the platy shell fragments can be easily aligned parallel to the vessel walls by paddling, thus strengthening the walls in the very direction made weakest by coil construction.

Rye's experiments demonstrate persuasively that shell's mechanical disadvantages can be largely overcome if salt or saltwater is added to the clay, as this alters the chemical reactions that cause the problems (Rye 1976). However, his work does not rule out other corrective measures as well. Shepard points out that shell can be pre-oxidized before it is added to the clay to reduce the risk of decomposition, and firing in an atmosphere with considerable carbon dioxide will also raise the temperature of calcination, so that the undesirable chemical reactions are avoided (Shepard 1956:30). Studies have not been done as yet to determine whether either of these procedures was used with New England shell tempered ceramics, and at this time it seems most likely that shell tempering was only used on the coast, where the necessary seawater was available. Stimmel et al (1982) have argued that salt was traded throughout the Midwest and used in making the shell-tempered Mississippian vessels, but a similar trade in salt cannot be documented for New England. Terry Childe has pointed out the New England potters may have used marine clays, already impregnated with salts, to make their shell tempered vessels (Childe, personal communication).

The apparent return to grit tempering in the Shattuck Farm area must also be explained, but this change is associated with a whole series of changes in pottery manufacturing procedures which will be discussed later.

In forming pots, coiling seems to have been used throughout the sequence studied here, as indicated by coil breaks on sherds of all periods represented in the excavated sample. Coil fractures were found on sherds from at least one Early Woodland vessel, two Middle Woodland vessels, five shell tempered vessels and two Late Woodland vessels with fine grit temper. The frequency of sherds with coil fractures is low for all time periods, but it must be remembered that coil fractures should not occur if the coils have been annealed properly. Kenyon has argued that some very late Late Woodland ceramics were formed by the paddle and anvil techniques documented for the Iroquois and Huron (Kenyon 1979:15-17). The Shattuck Farm sample would suggest rather that coiling was used in the initial vessel construction, but that vessels were then well paddled. Thomas's findings of unfired coils and an incomplete coiled pot at the Contact period Fort Hill site are further evidence that coil construction was still used in New England in the later periods (Thomas 1979:374). Coiling is not necessarily the only procedure used on vessels; combinations of coil and slab construction are certainly a possibility, as many ceramists form the bases and bodies of vessels with different procedures. In addition, some miniature vessels at Shattuck Farm appear to have been formed primarily by pinching the clay into shape.

Vessels at Shattuck Farm were paddled to anneal the coils, align temper fragments and to remove air, and textured paddles seem to have been popular for most periods. The texture is most likely to have been provided by cord wrapped around wooden paddles, but fabric may have been used in some cases. It is possible that textured paddles "grab" the wet clay better, and their use would very likely have made the pots easier to handle while they were wet. It

is also possible that use of a textured paddle was not technologically important, but was simply a favored style of surface finishing.

During the earliest period of ceramic manufacture, marks of the textured paddle were left on the inside as well as the outside of the vessel. The advantage of this procedure is obscure; it cannot be argued that the marks are attempts to imitate baskets, since pots are unlikely to have been functional replacements for baskets. Also, soapstone bowls would appear to be more reasonable functional predecessors in New England, and they have smooth interior surfaces. I can only suggest the possibility that rough surfaces were adaptive for dealing with the strong temperature gradients that must have been a problem with such thick walled and conical-based vessels. Rough surfaces do not provide resistance to crack initiation, but rough surfaces plus large temper particles might have helped increase resistance to crack propagation, because most cracks would quickly hit a temper particle or a free surface. Later, texture was either not applied to the interior of vessels, or else the marks were wiped or scraped smooth. This must have had the effect of making vessels considerably easier to clean between uses.

The exteriors of Early Woodland vessels are usually textured all over, but in subsequent periods exterior surfaces were nearly always smoothed around the lip, rim, and neck, most probably so that decoration would show clearly. In some cases vessels appear to have been smoothed all over, and this procedure seems to have been especially common on Middle Woodland vessels at Shattuck Farm. Late Woodland vessels appear to have often been left rough below the shoulder, perhaps in order to increase conduction of heat by increasing surface area, or perhaps to increase friction between hands and vessels, thus making vessels easier to handle.

As Table 58 demonstrates that the general size of vessels has been relatively constant through time, with height averaging about 28 cm for this sample and

usually roughly equal to the maximum diameter of the vessel. Table 62 shows other data relevant to vessel shape, and several changes over time are evident. These trends can only be suggested by such small samples, but they are supported by similar trends in adjacent parts of the Northeast. First, there appears to be a slight increase in size, which may be related either to a slight increase in average family size or to a slight increase in sedentism, since larger vessels are more difficult to move and easier to break. There are also changes in vessel proportions related primarily to the two major shape changes occurring through this sequence; bases change from pointed to globular, and necks become increasingly constricted. The changes in bases and necks may be occurring at slightly different rates, but both are probably related to the same factors: increasing efficiency of cooking, and changes in how the vessel is positioned over the fire.

Pointed bases are perhaps the most stable shape if vessels are usually set into depressions in the ground, or supported by surrounding rocks in a fire (Cf. Harriot 1972), but this base shape creates awkward thermal gradients in the vessel walls and would not heat the contents of the vessel evenly. Rounded or more globular bases would be more stable on flat surfaces, and should heat the contents of the vessel more evenly and rapidly, especially if the vessel were suspended over the fire. A constricted neck might help the vessel contents to heat faster by reducing the area of possible heat loss from the surface of the contents, and would also facilitate suspension of the vessel by means of thongs or cords around the neck.

Collars on vessels are very late in this area, as has been discussed earlier, and they probably had primarily stylistic functions. However, they may have been a means of reinforcing the rims for more secure suspension, or they may have helped prevent the vulnerable vessel lips from chipping. Handles are not found on vessels of this area.

Table 62. Vessel Shape and Decoration Through Time  
(See also Table 58 for Vessel Measurements)









Period	Vessel #	Shape	Temper	Outer Surface Finish	Decoration	Context	Province	Reference
Early Woodland	1		?	cord-marked	none	?	Plymouth	Fowler 1952
	2		?	cord-marked	none	?	Lake Assowampsett	Fowler 1952
Middle Woodland	3		shell	cord-marked	cordmarked on rim	?	Duxbury	Fowler 1965
	4		shell	cord-marked	cordmarked on rim	?	Duxbury	Fowler 1965
	5		medium grit	cord-marked	punctates	cache	Norwell	Scothorne 1971
	6		shell	cord-marked	trailed & push-pull	?	Plymouth	Whiting 1949
Late Woodland	7		shell	cord-marked	incised triangles	refuse pit	Kingston, MA	Viera 1962
	8		?	cord-marked?	incised	?	Seaver Farm	Dodge 1962

Table 62. Vessel Shape and Decoration Through Time (Continued)



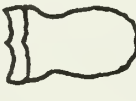












Period	Vessel #	Shape	Temper	Outer Surface Finish	Decoration	Context	Province	Reference
Late Woodland	9		medium grit	cord-marked	none	burial ?	Tyngsboro	Bielski 1962
Contact Period	10		?	smooth	incised chevrons	?	Cape Cod Canal	Brewer 1961
	11		?	smooth	incised	?	Barnstable	Johnson 1962
	12		?	smooth	incised	?	Seaver Farm	Dodge 1962
	13		fine grit	smooth above, cord-marked below	incised	refuse pit	Middleboro	Greene 1961
	14		?	smooth above, cord-marked below	incised & punctate	burial	Revere	Hadlock 1949
	15		?	smooth	incised	?	Seaver Farm	Johnson 1962

Table 62. Vessel Shape and Decoration Through Time (Continued)

Period	Vessel #	Shape	Temper	Outer Surface Finish	Decoration	Context	Province	Reference
Contact Period (Miniatures)	16		shell	smooth	applied faces	burial	Wapanucket	Robbins 1959
	17		shell	smooth above, cord-marked below	incised & punctate	burial	Hyannis	Vidal et al 1950
	18		fine grit	smooth	lobes	burial	North Middleboro	Fowler 1974
	19		?	smooth	punctate ?	?	Ft. Pecowic Springfield	Bielski 1962
	20		fine grit	smooth	notched	burial	North Middleboro	Fowler 1974
	21		fine grit	smooth	?	burial	Marblehead	Hadlock 1949
	22		fine grit	smooth	incised	burial	North Middleboro	Fowler 1974
	23		shell	smooth	punctate	burial	Burr's Hill, RI	Mrozowski 1980

The final shape change to be discussed here involves the thickness of vessel walls. In the excavated sample from Shattuck Farm, early Woodland sherds ranged from about .6 to 1.1 cm in thickness, while Middle Woodland sherds varied from .5 to .85 cm in thickness. Early Late Woodland sherds ranged from .45 to .7 cm in thickness, and the later Late Woodland sherds from .35 to .6 cm in thickness. Thickness varies somewhat over the vessel, and was also undoubtedly positively correlated with the size of vessels (Braun 1982). Vessel walls appear to be of more uniform thickness in the later vessels, while early ones vary considerably over a single vessel.

As discussed previously, ceramic decoration at Shattuck Farm is assumed to have changed over time in ways parallel to those documented elsewhere in the Northeast. It is interesting to note that the broad types of changes conform closely to what would be predicted given Shepard's statements as to the influence of temper on vessel surface finish and decoration (Shepard 1956:26, 198). Early vessels are finished almost solely by cordwrapped paddle marking, a very appropriate procedure when temper fragments are coarse and surfaces therefore necessarily uneven to begin with. When temper fragments became smaller, surfaces could be smoothed without fragments of temper dragging or chipping on the surface. However, the primary decorative techniques still involved impressing and stamping, which would give fairly clear results because temper fragments would simply be pushed deeper into the vessel walls by the decorating tools. Extensive incising, linear stamping, and closely spaced, intricate designs only appeared when fragments of tempering material were quite small, so that incising tools could cut cleanly through the clay.

Design motifs and over-all patterning of decoration cannot be studied with the ceramic sample from Shattuck Farm because most sherds are quite small. Type of decorating tool was discernible on nearly every decorated sherd, however, and thus the following discussion of decoration will focus on this attribute.

Further discussion of design elements, and definitions of terms, can be found in Chapter 4.

The number of different types of decorating tools may have been fairly limited, although the details of tool forms and the ways in which they were applied do vary considerably. The assumption made here is that ceramists often used the same tool for more than one type of decoration, rather than making a separate tool for each type of decoration. This procedure would be sensible for fairly mobile populations, and would also explain why certain combinations of marks often appear on the same vessels.

A basic tool for ceramic manufacture in New England appears to be a paddle, probably made of wood and either smooth surfaced or textured, used for initial paddling of the walls during vessel formation and also for surface finishing or decoration. The final paddling was often done very carefully so that the direction of the texturing was aligned on the vessel. The lateral edges of this paddle may have been used as impressors to make the marks called "cord wrapped stick" decoration. Also, the distal end of these paddles could have been scored or cut to form "dentate stamps". However, both dentate stamped and cordwrapped stick impressions may also have been made by specialized tools.

Awls, combs, or other thin cylindrical objects such as reeds may have been used to produce punctations and "comb impression" markings. Impressions apparently made by fingernails don't appear on the Shattuck Farm ceramics in this sample, and scallop shell decoration is very rare. Both of these decorative techniques appear on sherds in other collections from the site, however (Kenyon 1983). It is interesting to note that reed and scallop shell impressions appear on both grit and shell tempered sherds, unlike most of the other decorative techniques (Table 61). Furthermore, all the sherds with these decorations were found within 10 to 15 meters of each other in Locus D,

suggesting that there was a short period of time when those elements were used, and that during this time some ceramists in the group used shell temper while others used grit.

Incising could have been done with any sharp edge, including random flakes, lithic tool edges, the corners of paddles, the points of awls, etc. Thus incising could potentially have been combined with many of the other decorative styles, although it usually was not.

Another tool that appears to have been used on New England ceramics during both the Middle and the Late Woodland is a thin, flat object that leaves impressions about one cm long. Impressions of this length were first noted at the Calf Island site (Luedtke 1980a:48), and many rocker, dentate, and linear stamped impressions at Shattuck Farm were the same length. This tool may have been made of wood and could even have been a corner of the paddle. However, another possible candidate would be a deer rib, which is the proper width, readily available, and would have been an admirable tool for pottery manufacture in general. With a natural curve along its length, one side of which is sharp and the other of which is rounded, a deer rib would have made a fine tool for smoothing the neck area of a vessel, shaping the rim, and perhaps even for smoothing and scraping the insides of vessels. The distal end of a deer rib could have been thinned and flattened to a sharp, straight edge which could be either flat, curved, or even notched, and which could have been used for dentate, rocker, or linear stamping. The corner of such a tool could have been used for incising, and the length of it, wrapped with cord, could have been used to make "cordwrapped stick" impressions. I am not aware that such a modified deer rib has been found at any New England archaeological site, but it might show minimal modification and perhaps not be noted as a tool. Use of a deer rib for ceramic decoration is suggested here as a hypothesis for further testing.

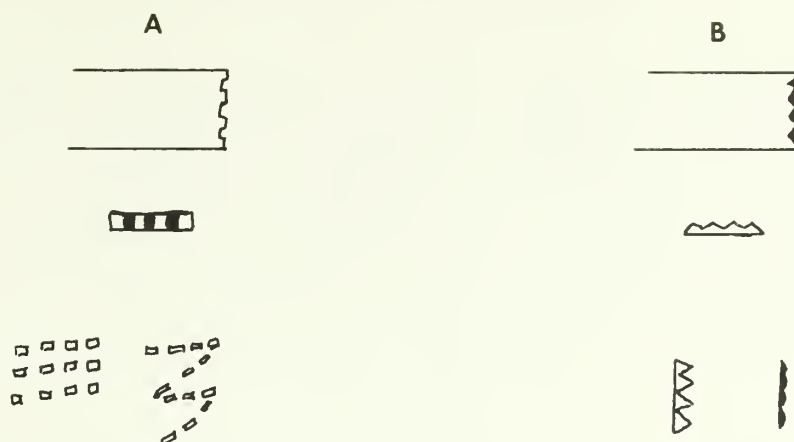


Figure 34. Ceramic Decoration Tools. A = Middle Woodland tool: top view, front view, and typical impressions. B = Late Woodland tool: top view, front view, and typical impressions.

If the same type of tool was used to produce the one cm long impressions on both Middle and Late Woodland vessels, the details of shape of that tool and the manner in which it was applied varied. Impressions on Middle Woodland vessels indicate that the tool was left as a solid straight line, like the edge of a chisel, or else notched to form from one to four teeth, usually square or pointed. During the Late Woodland period the tool was serrated and was not cut clear through (Figure 34). The tool was usually applied perpendicular to the vessel surface during the Middle Woodland, and often rocked over the surface. During the Late Woodland, the tool was more often applied at an angle to the surface, leaving a pattern of triangles joined at the base. It was sometimes applied perpendicular to the surface, however, and then it left the impression of a straight line with one side flat and the other slightly wavy.

Table 63. Rim Shapes by Time Period at Shattuck Farm

Rim Shapes	Early Woodland	Middle Woodland	Late Woodland (shell temper)	Late Woodland (grit temper)	Total
Round	2	7	4	2	15
Round & Decorated	1	1	3	1	6
Flat		4	4	2	10
Flat & Decorated		5		1	6
Flat & Tapered		1	7	1	9

Spacing and orientation of the design elements described here was difficult to determine on the Shattuck Farm sherds because of the small size of most sherds. Usually only one decorating tool appears to have been used on each vessel, though it might be used in more than one way.

Table 63 shows the distribution of rim shapes by time period, and there is a trend toward flatter rims through time. The same trend was noted by Bullen in his sites in the nearby Shawsheen River basin (Bullen 1949:14-16). It should be noted that in several cases where numerous rim sherds from the same vessel were found, the rim varied from quite round to rather flat. It should not be forgotten that these were hand made vessels, and subject to all the irregularities and asymmetries that such a manufacturing mode implies.

Most vessels appeared to have received all their surface finish and decoration while the clay was still relatively plastic, but some appear to have been burnished, probably after the clay had partially dried.

Firing is the crucial final step in pottery manufacturing. Kenyon found that ceramics from the Smyth site had been fired to temperatures between 600°C and 800° - 900°C (Kenyon 1979:23), consistent with firing for perhaps 30 minutes over a campfire. This mode of firing is also supported by the occasional smudge spots and uneven coloring of the baked clay. Most Shattuck Farm ceramics, like those from other Massachusetts sites, are various shades of buff, light red, yellow, or brown. Such colors indicate firing under oxidizing conditions, which would also be normal for vessels fired over an open campfire.

The thin walled, finely tempered, carefully made wares of the late prehistoric and Contact periods have attributes that stand in marked contrast to earlier wares, and which suggest a change in firing methods. These latter wares are usually grey or black in color, suggesting that they were fired in a reducing atmosphere. It is also possible that grease, gum, or blood were added to the clay, making it easier to work and giving a dark color to the fired clay (Shepard 1956:137). They also appear to be a little harder than the earlier wares, although they do not test markedly higher on the Mohs hardness scale, and this could suggest that they were fired to a slightly higher temperature. Both a higher temperature and a reducing atmosphere could have been achieved if the vessels were fired in a closed fire, perhaps in a small pit or even on the surface, but with the fire being covered with bark or other organic materials during firing. Closed fires would not require complex technology, but they could result in a considerable difference in ceramic firing.

There would almost certainly have been a degree of breakage during the firing process, even for expert practitioners. In fact, sites with many sherds may well be sites where ceramics were manufactured, rather than sites where many pots were used and broken. This could explain the predominance

of ceramics at coastal sites in later periods. Rye (1981) gives criteria for distinguishing fractures which have occurred during firing, and it would be useful to look for such marks on sherds from sites where ceramics may have been made.

Once manufactured, Massachusetts ceramics received hard usage. Foster has suggested five factors influencing vessel use life, and these will be considered with relevance to conditions in Massachusetts (Foster 1960). Foster's factors are: 1) strength of the vessel, 2) frequency and type of use, 3) whether used at or above ground level, 4) whether children and domestic animals have access to pots, and 5) the price of ceramic vessels. I would add a sixth factor, degree of residential mobility, which was not considered by Foster because it was not relevant to the peasants he was studying.

Massachusetts vessels are low-fired earthenware with rather large quantities of temper, so they are not very strong. Hardness values of three to four on the Mohs scale are typical (Kenyon 1979, Dincauze 1975). They were used as cooking vessels, and several studies of vessel use lives found that cooking vessels had the shortest use life of all the vessel types used by each culture (Foster 1960, David 1972, DeBoer 1974). They also had to withstand repeated thermal stress, probable daily use, and the increased rate of breakage that seems likely for vessels without handles that had to be put on and taken off open fires without benefit of asbestos pot holders.

The frequency of use would have depended largely on how many vessels were available for a family's use, as well as how much special processing of foods was done. A vessel was needed at least once a day for the major meal. The wise family would have had more than one vessel, in case of breakage, but not so many that transporting them would be a problem. Morton probably expresses the predominating attitude toward ceramics, as well as toward other heavy or bulky objects; "They love not to be encumbered with many utensils,

and although every proprietor knowes his owne, yet all things (so long as they will last) are used in common amongst them." (Morton 1883:177). Sharing of ceramic vessels might have been one buffer against inopportune breakage. In our best description of home furnishings during the early Contact period, Mourt's Relation describes earthen pots in the plural, so this household had more than one but presumably not many such vessels (Mourt 1963:29). The increase in size variation among late prehistoric and Contact period vessels (Table 58) suggests that these later households may have had more vessels than earlier households, perhaps because of the increased sedentism of the late period.

Foster found that vessels used at ground level broke more often than those used on tables or counters, presumably because of the fact that they were continually being moved from higher to lower places, and perhaps because vessels are more vulnerable to breakage on the ground. Massachusetts ceramics were presumably used most frequently at ground level, and thus would have been at increased risk of breakage. Also, they could not have been kept separate from dogs and children, which further increases the likelihood that they would be broken. Finally, their general shape is not very stable on flat surfaces, even in the later periods, and this must have contributed to the frequency with which they were tipped over.

Foster's fifth factor was cost; people take more care of valuable possessions than they do of those that are inexpensive or easily replaced. Since Massachusetts ceramics were domestic products and the raw materials for manufacturing them were widely available, we can assume that vessels were relatively "inexpensive".

An additional factor, not relevant to Foster's peasant studies, is the frequency with which vessels must be transported. During the Contact period, ceramic vessels were apparently not taken on most hunting or war journeys (Williams 1973:100), but their distribution on short term and special purpose

camps such as Calf Island suggests that they were transported regularly between various seasonal settlements, and this should have increased the risk of vessel breakage.

All in all, a relatively short use life would be predicted for Massachusetts ceramic vessels of all time periods. For perspective, Foster found that the use life of cooking vessels ranged from six months to one year for glazed vessels used daily in a Michoacan village (Foster 1960). David found Fulani cooking vessels to last 2.5 years, but they were not used daily (David 1972). DeBoer calculated an average use life of .84 years for cooking vessels in a Peruvian village (DeBoer 1974). All of the above examples come from sedentary villages, which implies that Massachusetts ceramics would have had a far shorter use life than any reported here. Ceramic vessel use life in prehistoric Massachusetts was surely less than six months, and may have been as low as one or two months with daily use.

There are archaeological data relevant to the numerical relationship between people and pots from two New England sites. The first is Fort Hill, a Contact period site excavated by Peter Thomas, who estimates that the site was occupied by 500 people who broke 1200 earthenware vessels over a six to eight month period (Thomas 1979). Assuming four people per household and a six month occupation, this would mean that 1.6 vessels were broken by each household every year. Since metal kettles were also commonly used by these people, an even greater rate of ceramic usage would have to be assumed for the prehistoric period.

The second site is Calf Island, where it is argued that two households broke about 10 cooking vessels over a period of somewhat less than a month (Ludetke 1980a). This would mean a breakage rate of over five vessels per household per month, and 60 vessels would be needed by each household each year. This seems extremely high.

Both data sets can be reconciled if we assume that the breakage rate was artificially high because ceramics were apparently being manufactured, as well as used, at both sites. Ceramic manufacture could have taken place any time when the weather was warm and dry enough for vessels to dry properly, which would mean essentially May through September in New England. Vessels could be made in small batches, as needed, since the entire process might not take much longer than a day (although longer times for preparing the clay, forming the vessels, and drying the vessels would probably have resulted in better quality ceramics). However, more vessels would have to be made in the fall in order for families to be well-provided over winter, when raw materials of all kinds were not available and when ceramics would not dry or fire properly. Both Fort Hill and Calf Island were occupied during the fall, and both show evidence of ceramic manufacturing.

An average use life of one month is not an unreasonable assumption for heavily tempered earthenware in daily use, and this use rate would mean that each household would have to make a minimum of seven vessels in the fall to ensure that there would be enough to last the winter. If we also assume a breakage rate of 30% during firing, then each household would have to make a minimum of 10 vessels each Fall so that seven would be likely to come through the firing process without breaking. This would mean that about three vessels per household would have been deposited at each site because they broke during firing, along with however many vessels broke during use while the site was occupied. As Table 64 shows, the consequent calculations result in numbers fairly close to those actually observed at the two sites discussed above. Also, the average number of vessels needed per household per year under the above assumptions would be 12, and this seems intuitively more reasonable than the values determined inductively for Calf Island and Fort Hill under the assumption that all vessels were broken in use.

Table 64. Ceramics in Middens at Two New England Sites

Site	Expected # of Vessels Broken in Firing	Expected # of Vessels Broken During Use	Total Vessels Expected	Total Vessels Observed
Calf Island	6	2	8	10
Fort Hill	375	750	1125	1200

There are no obvious patterns for the disposal of ceramics in New England archaeological sites. In some cases nearly complete vessels appear to have been left where they fell at Shattuck Farm, while some vessels at Calf Island appear to have been neatly swept into pits (Luedtke 1980a). Ceramic vessels have been found as caches (Scothorne and Scotthorne 1971) with various sorts of contents including lithic materials. They are also commonly found in burials of the Contact period, but are not common in earlier burials (Table 62). It may be relevant to note that several early records describe considerable quantities of grave goods left on the ground surface above graves (Mourt 1963:27, Williams 1973:248). It is possible that the European curiosity and penchant for disturbing such graves resulted in an increased tendency to bury grave goods down with the body.

Socioeconomic aspects of ceramic production in Massachusetts are even more speculative than are aspects of manufacture and use. Women made ceramic vessels during the historic period (Williams 1973:215) and the assumption that vessels were used almost exclusively for cooking would seem to put them securely into the domestic sphere for past periods, also. The apparent lack of numerous practice pots suggests an apprentice model for learning to make ceramics.

Craft specialization in ceramic manufacture perhaps of the "cottage industry"

type (Prentice 1983), is not mentioned explicitly in early historic documents for New England but is nevertheless an intriguing possibility. Roger Williams makes the following statement in the context of a chapter on trade: "They have some who follow onely making of Bowes, some Arrowes, some Dishes, and (the Women making all their earthen Vessells) some follow fishing, some hunting: most on the Sea-side make Money, and store up shells in Summer against Winter whereof to make their money." (Williams 1973:215). This surely implies incipient craft specialization in the region, although it is unclear whether Williams is referring to specialization by individuals, by groups, or both.

Trade in earthenware pots is also described by Morton (1883:159) and by Wood (1977:81), who specifies the Narragansetts as a source of vessels for the Massachusetts Indians. Incipient craft specialization would also explain Gookin's comment that clays were scarce (Gookin 1792:11), since the very finest clays desired by specialists would indeed have been scarce, and deposits might have become exhausted easily.

Such a change in the organization of ceramic production should be archaeologically detectable. Suzanne DeAtley has suggested that the beginnings of the craft specialization in ceramic manufacture which is well-documented for the Southwest can be detected by a change toward increased technological homogeneity of vessels. Compared to earlier periods in that region when ceramics were produced by each household, a restricted number of clay and temper sources were used after craft specialization began. Also, temper became homogeneous and well-mixed in vessel walls, and the general quality of vessels was markedly higher (DeAtley personal communication).

Kenyon has noted just such a contrast between the majority of Smith Site ceramics and three incised sherds which represent the late prehistoric or early Contact period at this site (Kenyon 1979:15-17). Her thin section studies found that the three late sherds were characterized by thinner vessel walls,

and a regular distribution of temper particles by size, compared to vessels of earlier periods. Both the latter attributes imply very thorough paddling of the vessels after they had been formed.

This study of Shattuck Farm ceramics also found striking contrasts between the shell tempered ceramics assumed to represent the early Late Woodland here and the fine grit tempered ceramics assumed to be of later Late Woodland age. The two wares differ significantly in many technological attributes, as discussed above, but share a general similarity in decorative elements (Table 61). The exact temporal relationship between these two ceramic wares at Shattuck Farm is not clear, of course. If they did not overlap in time, it would suggest either general adoption of a radical new ceramic technology, or else a shift in territorial boundaries that brought a new group of people with a different ceramic technology to Shattuck Farm. If the two wares do overlap temporally and were made by the same social group, as might be implied by the continuity in decoration, one could argue that a situation existed in which most women still made ceramics, but some had begun to specialize in ceramic production and were using a variety of new procedures to create distinctive new wares. The possibility of incipient craft specialization in ceramics is thus a rather speculative possibility that needs further testing in southern New England.

To summarize changes in Shattuck Farm ceramics over time, there appears to have been a long period of considerable stability or conservatism from the early Woodland through the early part of the Late Woodland periods. Decoration changed, of course, but vessel size and shape varied only slightly. Vessel walls became a little thinner and temper became finer, probably resulting in greater resistance to thermal stress at the expense of mechanical strength. This loss may have been compensated for by improved methods of transporting and handling vessels, and perhaps by a change to suspension of pots over fires

so that they would heat more evenly and there would be less steep thermal gradients across the vessel surface.

Sometime during the later part of the Late Woodland, perhaps around AD 1200, ceramics with markedly thinner walls, more uniformly sized and distributed temper fragments, and attributes indicating that they had been fired to higher temperatures in a reducing atmosphere appeared. These changes directly parallel changes Braun has documented for Midwest ceramics, although this shift was some three to five centuries earlier in the Midwest (Braun 1980, 1983). Braun correlates these changes with the changes in diet and food preparation techniques that resulted from the adoption of intensive horticulture. As corn began to play a central role in diet, there was a change in cooking methods from simmering to boiling, in order to process corn most effectively. This shift selected for increased resistance to thermal stress in ceramics, and vessels with thinner walls, more globular forms, and increasingly fine-grained temper fragments resulted.

Cultigens became important in the New England diet somewhat later than in the Midwest; the earliest date for an archaeological recovery of corn is still AD 1160 (Ritchie 1969:52), with a slightly earlier date of AD 1070 for New York state (Ritchie 1980:xxv). If indeed M.K. Bennet is correct in his reconstruction of the predominant role played by corn in the Contact period Indian diet (Bennett 1955), then the period from 1000 to 1600 saw a dramatic change in subsistence that must have had far reaching effects on many aspects of southern New England cultures. Changes in social organization, division of labor, and settlement must have occurred. In terms of ceramics alone, there were changes in vessel shape, formation, and firing attributes, and perhaps changes in functions and in mode of production.

A definitive study of trends in ceramic decoration over this same time period would require a larger and better dated sample than is available for

this study. However, I would like to suggest the possibility that regional styles may have appeared by Middle Woodland times and continued on into the Late Woodland. For example, a large number of vessel lips from the Middle Woodland Wheeler's site are decorated with what Barber has termed "oblique exterior impressions" (Barber 1979:402), and such impressions are also found on some of the Late Woodland vessels from the nearby Morrill Point site (Barber 1979). This same motif was found on Shattuck Farm sherds ranging from Middle Woodland to late Woodland in age. However, it was not observed on sherds from the Boston Harbor Islands (Luedtke 1975, 1980a) or from the Charles River basin (Dincauze 1975). The existence of this and other persistent differences between ceramics used in the Charles and Merrimack basins, only some 45 kilometers apart, suggests the existence of social groups with some continuity and with the need to signal their separate identities because they interacted regularly. Such persistent differences would also suggest that ceramic sequences need to be developed on a very local basis in New England; the changes discussed here at Shattuck Farm may be irrelevant to the ceramic sequences for Taunton or Cape Cod.

The major stylistic change in this region occurs right at the Contact period, when "Iroquoian" style vessels with complex incising, collars, castellations, and appliques appear, virtually always in sites with historic trade goods. These vessels can be interpreted as evidence of the extension of Iroquois influence into this region, but most appear to have been made locally and are not trade vessels. Since relations between eastern Massachusetts Indians and the Iroquois were not notably warm during the Contact period, it is difficult to explain why Iroquoian decorative styles were imitated here. It is possible that these styles were spreading outward progressively, and happened to reach southern New England by coincidence in the Contact period. However, another possible explanation would start with the observation that

previous ceramic vessel shapes were not very different from the basic shape of metal kettles, if handles and feet are disregarded. However, the Iroquoian vessel shapes and decorative styles are very distinctive, and different from any European ceramic or metal containers. Perhaps the adoption of Iroquoian styles in Massachusetts is an example of the phenomenon described by Hodder (1979), where material symbols of a group's identity become most prominent when the group is in competition with another group for resources. Indians were competing with Europeans for many resources during the Contact period, and Iroquoian ceramic styles may simply have been more suitable for expressing Indian identity than were traditional Massachusetts ceramic shapes and styles.

This analysis has suggested that prehistoric New England ceramics varied over time and space in response to changes in diet, settlement pattern, sociopolitical organization, and related technology of cooking fires. Other factors, including ideological and religious influences, have also been suggested. The systemic nature of culture implies that change in one of these subsystems was often associated with changes in the others as well, and thus some changes in ceramic attributes may have been nearly synchronous although they were actually caused by different factors. The details of these processes of change are surely more interesting than are the broad patterns of change, however, and many fascinating problems are yet to be addressed using ceramic data. The creation of types would then appear to be a relatively uninteresting activity, and one that may not even result in the temporal resolution possible with attribute studies (Braun 1982).

An object lesson is provided by Wright's study of the ceramics from a Huron village in Ontario which was nearly completely excavated, providing unique information about the structure of the community that lived there. The Nodwell site was occupied for just a few years around AD 1340 by a single community, whose component social groups were localized in longhouses, each of

which was associated with numerous pits. Fourteen of the standard Huron ceramic types were found at the site, and they were distributed randomly between the longhouses. However, when design and rim attributes were examined in detail, the ceramics yielded much more interesting information than did a simple listing of types per house. "These data not only suggest the existence of conservative and progressive houses as well as intermediate houses at the Nodwell site but also indicate that the attribute trends are independent of one another. In short, we appear to be dealing with a constellation of attributes which possess their own rates of change through time. To force these independent trends into a closed system like the type is, in my opinion, doing the data a disservice." (Wright 1974:243-244).

#### Ceramic pipes

Ceramic pipes are conspicuous by their absence at Shattuck Farm, both in the excavated sample and in the collections. Bullen reported none from his inland sites, either (Bullen 1949), and Moorehead states that pipes were scarce in collections from the entire Merrimack drainage (Moorehead 1931:49). However, pipes are relatively common at coastal sites such as Calf Island (Luedtke 1980) and Clark's Pond (Bullen 1949). It is difficult to believe that smoking was a seasonal activity or restricted to certain districts, so I would suggest again that broken pipes may be most common where they were made, not where they were used. Compared to other ceramics, the technology of pipe production appears to have involved considerable care and perhaps special clays. Once these pipes were made, they were probably carefully curated.

## FLAKED STONE TOOLS

### Projectile Points

Ethnographic analogy suggests, and the occasional discovery of these tools wedged firmly into the bones of animals at archaeological sites confirms that most projectile points were indeed fastened to the tips of spears, darts, or arrows and used most frequently for hunting, sometimes for fishing, and occasionally in warfare. Use wear studies have demonstrated, however, that some items in this shape category were actually used occasionally or even primarily as knives (Ahler 1971). The sample excavated at Shattuck Farm did not include enough projectile points of any one type to study in this way, so they will be considered here as primarily hunting and perhaps fishing tools.

It is important to note that projectiles tipped with stone points were not the only hunting tools used by prehistoric people. Bone, wood, bird claws, and antler are all mentioned as materials used for tipping arrows during the early historic period in New England (Salwen 1978:163). Early historic records also indicate that traps and snares were commonly used to procure animals, and were even used on game as large as deer (Mourt 1963:23). Therefore, this report does not assume a direct relationship between the quantities of stone projectile points found at a site and the amount of hunting that took place there.

This report also does not put undue reliance on projectile points as temporal markers, for two major reasons. First, we do not generally know the beginning and ending dates for the use of the various projectile point styles, although the periods when they were most prevalent are well known. Thus, small stemmed points are known to have been most commonly used during the Late Archaic, but they have been found in association with Early Woodland ceramics (Thorbahn 1982) and may have been used on up into the Woodland periods.

Second, there is considerable overlap in the attributes of some projectile point styles. For example, there is clear intergrading between Late Archaic Squibnocket triangles and Late Woodland Madison and Levanna points. Populations of these three types are easily separated on the basis of size, details of shape, and flaking techniques, but many individual points cannot be assigned unambiguously to one of these categories in the absence of other contextual information. I have discussed elsewhere the likelihood that many of the Shattuck Farm small triangular points, especially those made of felsite, may actually date to the Woodland period (Luedtke 1983).

### Biface

This term is used here to designate a broad category encompassing both bifacially worked tools used as knives, and also those products of early stages of tool manufacture known as blanks or preforms. Use wear analysis can be used to distinguish between these categories in some cases and where this was possible with the Shattuck Farm bifaces, individual tools were described further in the locus descriptions. However, use wear is often difficult to detect and interpret on quartz and weathered felsite tools, and where no use wear could be seen items are simply called bifaces. Also included in this category were broken fragments that had been bifacially worked but which could not be clearly assigned to any of the other tool categories. Thus, the term "biface" functions as a catch-all category in this report.

### Drills

These objects were not common in the excavated assemblages from Shattuck Farm. It is assumed here that stone drills were used primarily to make holes in harder materials such as wood, bone, shell, or even stone, while bone awls would have been used to perforate softer materials such as leather or bark.

### Scrapers

These tools are identified primarily on the basis of their very steep working edge angles, and this means that there is potential for confusion between scraping edges and edges that have been intentionally backed or blunted so that they will not cut hands or hafts. The general shape of the tools, the location of the steep edge, and the types of use wear can usually be used to tell these two situations apart. It is assumed here that scrapers were used on a variety of materials including hides, wood, and bone, and that the material scraped can sometimes be determined from the type of use wear on the tool. When this has been possible, the wear has been described in the locus descriptions. However, the study of use wear on felsite and quartz is still in its very early stages, and the types of wear associated with different types of worked materials are not as well known as they are for cherts and obsidians.

### Utilized flakes

These are undoubtedly more common than indicated in the locus descriptions because it was not possible to examine every flake under the microscope. Ethnographic studies of stone tool-using peoples indicate that unmodified flakes of appropriate sizes and shapes are often preferred to more formal tools for a variety of miscellaneous cutting, scraping, gouging, engraving, and whittling tasks (Gould et al. 1971:149). In determining the function of utilized flakes, I assumed that the flake had been used for cutting if use flakes had been removed from both faces of the working edge. If use flakes had been removed unifacially, I assumed the flake had been used for scraping.

### GROUND AND PECKED STONE TOOLS

Ground stone tools of all types were rare in our excavations, although they are represented in collections from the site. I assume general woodworking

functions for the objects generally called gouges, celts, adzes, and axes. Such woodworking tasks would include chopping firewood, making canoes, manufacturing wooden bowls and tools, and cutting poles for structures such as weirs, drying racks, and shelters.

#### Ulus

These tools are also often called semi-lunar knives, and they are usually assumed to have been used as knives on the basis of ethnographic analogy with similar tools still in use in recent years among Arctic and Subarctic peoples. However, microscopic examination of the ulu fragment found in locus D suggested that this tool had been used for scraping. This is not an unreasonable finding; because slate can be worked to a fine, smooth edge, it might be especially good for preparing skins, especially thin ones that might be easily torn by a less even chipped stone edge. It is also possible that a slate scraper would have been less easily fouled by animal fats.

In order to examine the issue of ulu function further, I examined a collection of 22 ulus from Essex County in the collections of the Peabody Museum of Salem, through the courtesy of John Grimes. Of these tools, 10 were not informative because they had obviously been discarded early in the manufacturing process or because no wear was visible due to weathering or the coarseness of the raw material. Of the remaining 12 ulus, 50% showed clear signs of having been used for scraping, with striations on the working edge perpendicular to that edge and with characteristic edge rounding and bevelling. Another 25% were ambiguous, with apparent evidence for both scraping and cutting, and 25% appeared to have been used for cutting. It should be noted that the examination and interpretation of marks on these slate tools was difficult because it was not always easy to distinguish striations resulting from manufacture and sharpening from striations resulting from wear. However, the distribution of wear types on whole vs. broken tools

may help resolve the ambiguity of the above findings. Only one of the whole ulus showed definite evidence of scraping, but 71% of the broken fragments showed such evidence. In one case (artifact E52.210) the ulu had broken and both pieces were recovered, and it was especially clear that one half had been used for scraping after it broke.

It can thus be concluded that many broken ulu fragments were used as scrapers, leaving open the question of how the whole ulus were originally meant to be used. I recommend further examination of ulus to resolve this point.

#### Miscellaneous ground stone

A variety of stone objects may have had technological, social, religious, or decorative functions, or all of the above. These would include bannerstones or atlatl weights, gorgets, ground stone rods, incised pendants, and worked graphite. All but the latter were very uncommon at Shattuck Farm. It is assumed that the graphite was scraped or ground to use as paint for bodies or for possessions.

#### Steatite bowls

Steatite, or soapstone, is found at Shattuck Farm in the form of fragments from bowls, which were presumably used as food preparation and serving containers.

#### Pestles

It is assumed that these cylindrical tools were used primarily for crushing seeds and nuts, but they may also have been used to break up animal bones to obtain marrow or bone chips. Hammerstones and wooden pestles may have been functional equivalents.

#### Notched cobbles and plummets

It is assumed that these tools are fishing gear, probably used as net weights and line weights, respectively. Both types are uncommon in the Shattuck Farm collections and were not found at all in our excavations.

Their absence does not mean that fishing was not important at the site. Spears, stationary nets, dip nets, and weirs were all used for fishing during the historic period (Josselyn 1674:141), and any of these methods may have been better adapted to fishing conditions at Shattuck Farm than were the methods which used net weights and plummets.

### Hammerstones

Hammerstones were the most abundant pecked stone tool type found in our excavations, so they can be discussed in greater detail than the others. Preliminary examination of the excavated hammerstones suggested that they could be subdivided on the basis of the location and form of battering on them, and three categories were established on this basis (Table 65).

Category A has battering centered on two opposed broad flat surfaces, and this pattern is generally associated with anvil stones. It is assumed that anvil stones were used as a base upon which nuts were cracked and upon which stone tools may also have been braced during manufacture. Since only a single example was excavated at Shattuck Farm, this category will not be discussed further. Category B hammerstones have battering, usually in small patches, focussed on the corners, protruberances, and edges of the stones. Category C hammerstones have battering in long, broad strips along the sides and edges of the tool, and sometimes have a slightly ground or smoothed surface adjacent to one of the battered strips.

Categories B and C differ in additional attributes as well. For one thing, Category C tools are markedly heavier than those in category B, with a mean weight of 976.3 grams (R = 330-2105 grams). In contrast, mean weight for category B hammerstones was 154.3 grams (R = 42.3-388 grams). All broken tools were excluded from these calculations. With the exception of the broken hammerstones, all others have not been modified substantially from their original form, and it is clear that there are differences in the shapes of the

Table 65. Hammerstone Data (weights for broken tools in parentheses)

Category	Provenience	Raw Material	Weight in Grams	Shape
A	D N3W84	diorite	810.0	round, flat
B	B S3E10	granite	367.0	egg shaped
	B S4E10	granite	388.0	lumpy sphere
	D N3W84	quartz	192.0	lumpy sphere
	E TP 3	felsite	(70.0)	irregular, lumpy
	E TP 3	quartz	57.7	flattened egg
	E TP 4	felsite	(59.0)	irregular, lumpy
	G N17E20	basalt	55.3	flattened egg
	G N17E25	quartzite	157.2	lumpy egg
	G N17E25	quartz	110.6	lumpy sphere
	G N17E25	siltstone	42.3	flattened oval
	G N17E25	granite	55.4	egg shaped
	H NOE10	quartz	(85.2)	egg shaped?
	H N4W16	quartz	208.2	lumpy sphere
	H N13W19	Merrimack quartzite	164.2	egg shaped
	H N30E0	granite	(52.3)	spherical?
	H N33E20	granite	43.2	oval
	H N42W16	quartz	164.5	lumpy sphere
C	A N7W14	Merrimack quartzite	1660.0	triangular, tabular
	G N5E19	granite	760.0	egg shaped
	G N16E17	Merrimack quartzite	521.0	quadrilateral, tabular
	G N16E18	granite	2105.0	truncated cone
	G N17E17	Merrimack quartzite	482.0	irregular, flat
	G N17E18	Merrimack quartzite	330.0	lumpy sphere
	G N18E19	granite	(421.0)	"orange slice"

cobbles in the two categories. Most hammerstones in category B are round or oval, while hammerstones in category C tend to be flattened and tabular.

Finally, the two categories differ in terms of the raw material selected.

Most of the tools in category B are made of fine-grained and tough materials; 35.3% are quartz, 29.4% are granite (usually fine-grained), 11.8% are felsite, and the rest are made of quartzite, basalt, siltstone, and Merrimack quartzite.

The tools in category C are predominantly coarse grained and crumbly; 57.1% are made of Merrimack quartzite and 42.8% of granite (often rather coarse grained).

All of these differences suggest different functions for the hammerstones in categories B and C. The location and form of battering on category B hammerstones indicates that the people using them wished to minimize the area of impact between the tool and the material being worked, so that the full force of a blow would be focussed on a relatively small area of the material being hit. They also chose cobbles of a size that fit comfortably in the hand, and which were made of tough materials that would be resistant to breakage. Stone knapping is one obvious activity that would fit this description, and some of the hammerstones are indeed closely associated with considerable debitage (i.e. Locus B). Others are not, however, and we can suggest that similar properties might be desirable for stones used to crack nuts or perhaps to break up animal bones, turtle shells, or sturgeon scutes.

Category B may also require further subdivision, as 5 of the hammerstones are markedly smaller than the rest, and would appear to be too small for effective use in most pounding tasks. They do not show bipolar battering, so were probably not used for indirect percussion. Perhaps they were hafted, or used for some task that required very little force.

Category C tools show battering in the form of broad, flat areas on flat but narrow surfaces of tabular cobbles which were usually made of relatively soft materials. They are also very large, suggesting that they may have been held in both hands and used to pound materials where a broad area of contact between tool and worked material was desirable. Use of these tools would certainly seem to result in less fine control over blows than would be possible with the hammerstones in category B. Crushing bones is again a possibility, and one might also speculate that these tools may

Table 66. Hammerstones by Locus

	A	B	C	D	E	G	H
Number of Hammerstones	1	2	0	2	3	11	6
Number of Square Meters Excavated	11	8	7	13	4.5	15	7
Hammerstones/m <sup>2</sup>	.09	.25	0	.15	.67	.73	.86

have been used to pound plant materials such as reeds, bark, or roots to prepare them for food or for use in basketry, cordage, or mats.

The proveniences shown in Table 65 would seem to indicate a strong association between hammerstones of both types and the loci near the marsh, and Table 66 demonstrates that this is not simply a function of sample size. Hammerstones were nearly 3 times as abundant in the loci near the marsh as they were at any of the other loci. This again suggests that many of them may have been used to process plants or other resources from the marsh.

In summary, hammerstones have been divided into two categories, representing use for highly focussed percussion, and for broad, diffuse pounding. It cannot be proven exactly what was being worked in either case, and it is assumed here that many hammerstones were multi-purpose tools. Some of them were surely used for stone working, but many were also probably used for tasks such as cracking nuts and animal bones, and perhaps for processing plant materials as well.

## DEBITAGE

This category includes all flakes without obvious wear, plus most cores. It was often difficult to draw a firm line between large chunky flakes and cores, especially with quartz, and thus many large chunky flakes were called cores. Since some of these showed signs of having been used, they were treated as artifacts in the locus description tables.

As described earlier (Chapter 4) flakes were described here in terms of size ranges, rather than "flake types", because of my increasing feeling of discomfort with regard to those traditional types. For example, I observed cortex on flakes ranging in size from 10 cm to less than .5 cm. Are all these to be called "decortication flakes"? Shouldn't we assume flakes with cortex will be abundant if small cobbles are used as raw material, and less abundant if big cobbles are used, no matter what kind of flaking is taking place? Size ranges and the presence or absence of cortex at least has the advantage of being objective and reproducible, even if the results are less easily interpreted.

In general, it is assumed here that stone working was not a very important activity at Shattuck Farm. The average number of flakes per square was 76 per meter square, with a range from four to 160 per meter square for the different loci. In contrast, flake density at the Neville site may have averaged 977 per meter square, on the basis of data said to be fairly typical for the whole site (Dincauze 1976:88). The Neville site is admittedly deeper than Shattuck Farm, but it was occupied over an equally long time span and is comparable in other ways (Luedtke 1983). Even the Calf Island site, interpreted as an occupation involving only two families for several weeks, produced a flake density of 24 flakes per meter square. However, at this site stone working was definitely occurring (Luedtke 1980a).

Thus, not a great deal of stone working appears to have been going on at Shattuck Farm, due in part to its location rather far from most sources of raw material other than quartz. It is also likely that the time of year during which the site was occupied, and the kinds of activities undertaken there, influenced the density of debitage. Most of the flakes found are assumed to be the result of resharpening, discard of utilized flakes or flakes saved but found not suitable for use, creation of flakes for use from cores, and final stages of manufacture from preforms. In a few cases, more extensive stone working occurred, as at locus B, and it often seems to have involved quartz.

#### MISCELLANEOUS MATERIALS

No prehistoric metal was found during our excavations at Shattuck Farm, and Moorehead states that metal items are not abundant elsewhere in the Merrimack Valley (Moorehead 1931). A "metal pendant" is noted in the Berry collection (Appendix A), but it is apparently a lumpy silverish object with a hole through it that is unlikely to be prehistoric (Kenyon, personal communication).

A blue glass bead in the Hertrich collection (Appendix A) may date to the Contact period, and presumably served decorative functions.

#### FEATURES

Features of many types are usually abundant at prehistoric archaeological sites in New England, and most New England archaeologists have the nagging suspicion that features should be telling us more than they do (Barnes 1980, Barber 1979). There have been several attempts to create typologies of features, but this would be unproductive in the present case because sample size is small and because it is once again more interesting to concentrate on feature attributes and the meaning of these attributes.

It will be useful to begin by consideration of the functions features perform. I am using the term feature here to mean discrete locations where human behavior has altered the ground surface for specific purposes, usually visibly and intentionally. Three features at Shattuck Farm are considered unintentional or at least not purposeful, and will not be discussed further. These include the pottery concentration (Locus C Feature 1) and two concentrations of fire cracked rock (Locus E Feature 2 and Locus G Feature 1). All other Shattuck Farm features were made to provide either storage, shelter, or heat. Each of these broad functions will be discussed generally, and also with regard to specific features at Shattuck Farm and at several other sites in the region.

#### Storage

Storage features in New England are usually pits, or cavities dug in the soil, sometimes lined with organic materials, and designed to contain something either temporarily or permanently. Above-ground storage in containers or structures also undoubtedly existed, but is almost impossible to detect archaeologically. Below ground storage would seem to be most desirable if the site inhabitants wanted the stored material to be out of the living areas and if they 1) would be resident at the site and could recover the material when needed, 2) would not need the material regularly and could thus cache it until they returned to the location at a later date, or 3) did not intend to retrieve the stored material. An implication is that temporary storage features should be associated with sites that were either permanently occupied, or which were regularly occupied at specific points in the seasonal round. There would seem to be no point in creating a temporary storage feature at a site that was used infrequently.

Early historic records mention food as the type of material most commonly put into temporary storage in New England (Table 57). Corn, beans, oil, and

acorns are all recorded as being stored in underground pits, which were lined with baskets, grass or bark. It can be assumed that the size of these pits would have varied directly with the quantity of material stored, so there could be rather wide variation in this attribute. It would seem most likely that food storage pits would be relatively deep, so that foraging animals would not scratch them open easily, and that the mouths would be somewhat restricted so that the storage pits could be sealed easily.

Caches of heavy stone tools and of bundles of preforms and blades have been found archaeologically in New England (e.g. Carty 1983), and these finds may represent temporary storage locations from which the items were never retrieved. By definition, most temporary storage caches would have been retrieved when the owner next visited the location and small, irregular, empty pits might be all that would remain of these storage features.

At Shattuck Farm, only Feature 2 at Locus C is interpreted as a temporary storage pit, based on its lack of contents and the presence of bark fragments that may represent a lining. Elsewhere in the region, Bullen states that some of the deeper pits at his sites were probably storage pits (Bullen 1949).

It is likely that many temporary storage pits were recycled into permanent storage or disposal features after the cached materials had been retrieved. Many items of refuse appear to have been left where they fell at campsites, but in other cases trash was apparently gathered or swept into pits (Luedtke 1980a). The likelihood of this occurring probably depended on how noxious the refuse was, how permanent the campsite was, and whether alternative modes of disposal such as dumping off the site or into water were practiced.

"Noxious" trash could include organic materials that either smelled particularly bad or were likely to attract animals, sharp or lumpy objects that would be uncomfortable or dangerous to walk on, and materials such as fire ash that could blow into people's eyes.

If a disposal pit were actually a recycled storage pit, it would have the same general attributes as the storage pits described above, perhaps with the mouth somewhat enlarged. If pits were created for trash disposal alone, they might be expected to be shallower and to have very wide mouths. In all cases, they should have trash in them. Unfortunately, some types of organic materials that might be considered noxious would not be preserved as anything more than a slight stain. Three features at Shattuck Farm appear to have been prehistoric trash disposal pits though all three contained primarily charcoal or ash. They are Feature 2 at Locus A, Feature 3 at Locus E, and Feature 4 at Locus G. Many of these features were found at Bullen's sites (Bullen 1949).

Burials can be considered a special form of permanent storage feature (or in some cases temporary storage, if burial rites included removal of the flesh and then reburial or cremation). Many burials apparently have been found at Shattuck Farm (Chapter 3) but most were excavated or destroyed long before the present project began. None were encountered in our testing.

#### Shelter

Features associated with shelter in New England prehistoric sites are mostly postmolds, though scooped out area may exist at some sites (Barnes 1980). Postmolds are the soil stains remaining from posts that formed the structures of houses, windbreaks, and palisades, and of internal constructions such as sleeping platforms or racks. Postmolds can vary in diameter, in their orientation in the ground, and in the shape of their terminations. Diameter and orientation are probably related to physical factors such as the load to be borne by the post, while shape of termination may be partly a stylistic attribute (Luedtke 1980a). Not all shelters would necessarily leave postmolds; brush windbreaks and tents anchored to trees or rocks, for example, would leave no traces. Postmolds clearly related to shelter were found only at

Locus G at Shattuck Farm, and only at Foster's Cove among Bullen's sites (Bullen 1949).

### Heating

Heating features are perhaps the most interesting type of feature at Shattuck Farm. These are defined here as features used to harness fire for the purposes of warming bodies; for preparing foods by parching, simmering, boiling, steaming, smoking, or drying; and for miscellaneous tasks such as fire-hardening wooden tools or working wood by charring. In order to achieve these ends, it is necessary to manipulate the various properties of the feature in order to obtain the best possible balance between three major goals which may not always be compatible. First, the feature must function effectively; the food must be heated to the proper temperature for the proper length of time, for example. Second, the feature should function efficiently, so that energy expended in preparing the feature and providing fuel for it is minimized. Third, the feature should function with minimal undesirable side effects such as sparks, smoke, or unwanted heating.

In creating heating features, there are a number of elements that can be combined in various ways to bring about the above goals. Given the observed complexity and variety of heating feature attributes in the archaeological record, it may be fruitful to assume that prehistoric people actually thought in terms of elements to be combined in various ways, rather than assuming that the people of each time period had a limited repertoire of feature "types" to choose from for their heating tasks.

Elements to be varied would include the location of the feature with regard to the topography; a fire up on top of a hill has different properties than one down in a hollow or one in a cave. Location of the feature with regard to living and activity areas is also obviously important. Feature size and shape can be varied, as can the amount of ground preparation; the

fire could be made on a natural ground surface, in a slight depression, or in a deep depression, depending on how focussed the heat must be. The surface can also be prepared by clearing or by lining it with clay, pebbles, or rocks.

Fuel is an especially important element in a fire, and can vary in terms of the type of fuel, the amount, the extent to which it has been dried or seasoned, and the size of the pieces used. Fuel type is probably the attribute most easily determined from archaeological features, and in New England wood was the primary fuel used. For woods, the most important distinction is probably that between the conifers and the hardwoods; resinous woods such as pine and spruce reach higher temperatures but are usually consumed faster and give more smoke than hardwoods such as oak and hickory, which burn slowly and give a steady heat (Johnson and Auth 1951:111). A summary of fuel types from a woodsman's point of view is instructive: "The resinous softwoods when seasoned generally make the best kindling. They catch and burn quickly. They are smoky, however, short lived, and prone to throw sparks. They are most valuable, in other words, when either we wish to start a fire or when we desire a fast brief blaze. The seasoned hardwoods in most cases provide both a steadier and longer lasting fire. They are particularly suitable for most cooking, as they disintegrate into hot enduring coals that afford the intense even heat usually then desirable." (Angier 1956:120).

Various "accessories" could also be used to modify the contact between the fire and the item or material being heated. Pottery is one obvious example of such an accessory. In New England foods were also suspended over fires on cleft sticks stuck into the ground (Wood 1977:86) or were placed on cooking or drying racks (Wood 1977:114) and these can also be considered feature accessories.

Perhaps the most common accessories were rocks, which can perform many functions in and around heating features. They can operate as supports for pots, as windbreaks to prevent fires from being scattered by the wind, or as protection for houseposts that would otherwise be in danger of being burned by fires inside structures (Josselyn 1674:126). Perhaps the most common use of rocks was as heat reservoirs; they could be heated and then plunged into liquids to cook the latter, they could radiate dry heat from within a feature, or they could produce steam if water was splashed on them after they had been heated.

Our understanding of exactly how these different elements function with regard to the three goals listed above is not generally well developed, and there are also many unanswered questions as to the archaeological traces to be expected from different procedures or combinations of elements. For example, can we distinguish "pot boilers" from "fire rocks" by differences in the ways they have fractured? What conditions result in considerable charcoal, and under what conditions do fires burn down to ash? Is soil reddening an inevitable result of any fire? If not, is it a function of the maximum temperature reached by the fire, of the duration of heating, or of the amount of oxygen allowed to reach the soil? Answers to these and to many other possible questions would greatly increase our ability to interpret the features we encounter in archaeological sites.

Some answers may be obtainable from the literatures of chemistry, physics, or fire science, but this is also a potentially fruitful area for experimental archaeology. For example, Barber recently constructed an experimental clam bake and observed the resulting attributes of the soil, the fuel, and the food remain (Barber 1979:161-163). Similar studies could produce considerable insight into the dynamics of heating features.

Our excavations at Shattuck Farm produced four distinct associations of

the elements discussed above, and each of these will be discussed and compared with similar features from other regional sites. The first, of which only one was found at Shattuck Farm is Feature 5 in Locus D, a large deep pit which contained much charcoal and no fire rock, was surrounded by reddened soil, and which may possibly have had an associated rack (Feature 6). It is similar in some attributes to Features 3 and 4 at the Wheeler's site (Barber 1979:153). However, it is deeper and more conical in cross section, and this shape, plus the other attributes discussed in the locus description, suggest that it was an earth oven, used to roast some food for long periods. The postmolds may then be unassociated, or may indicate that the feature was multi-purpose, and was used for drying as well as roasting purposes.

A more common kind of feature at Shattuck Farm is the small area of fire-reddened soil, usually round to oval in shape, about 30 cm in diameter, and only a few centimeters deep. Features 4 and 5 at Locus A, Feature 2 at Locus B, Feature 2 at Locus D, and Features 2 and 3 at Locus G all belong to this category. These features usually contained some ash, a little charcoal, a few scraps of fire cracked rock, and usually small quantities of sherds, calcined bone, and other domestic debris. These features are shallow and could easily be missed in excavation or be disturbed by plowing, so it is assumed that many more originally existed than were found during our excavations. I would argue that these features are the remains of small fires built right on the ground surface with minimal ground preparation, and that they were domestic heating and cooking fires. Supporting this interpretation is the fact that the charcoal associated with such features at Shattuck Farm is predominately dicot or hardwood charcoal, as would be expected given the discussion of fuel types above.

These features are similar to Barber's "small fire pits" (Barber 1979: 152) although the features he describes are somewhat deeper. Bullen does not

report such features from his sites, but again, they may have been missed during excavation or counted as stains or trash pits. His "3 stone fireplaces" may be an equivalent, however. Rocks in this and in the other cases above apparently functioned mainly as supports.

The other two varieties of heating feature at Shattuck Farm are associated with considerable quantities of fire cracked rock, in contrast to the two types discussed thus far. First is a type of feature usually referred to as a hearth, and which is large, oval or round, basin shaped, and carefully lined with rocks. Rocks and soil show considerable signs of fire. Only one feature of this type was found at Shattuck Farm, Feature 1 at Locus B, but 13 are reported from Bullen's Shawsheen drainage sites, where they were often associated with nut shells, sherds, and debitage (Bullen 1949). Because of these associations, Bullen interpreted these as domestic cooking features, and they may indeed have been the standard cooking feature for long-term camps. However, it is also possible that they were used for more specialized processing of some type.

It is significant that the hearth at Shattuck Farm and also one of Bullen's hearths are notable for their lack of associated domestic debris. The Shattuck Farm hearth is associated with two hammerstones, much quartz debitage, and a projectile point, but no ceramic or bone fragments were found. The hearth described by Bullen at the Hoffman site was even more unusual, as the ground for four feet (1.2 m) around it was cleared of everything including flakes (Bullen 1949:18-19, Hoffman 1942). Byers suggested that the Hoffman site hearth was part of a sweathouse (Byers 1944), and this is certainly a possibility for both of these features. The hearth at Shattuck Farm had unusually large quantities of primarily conifer charcoal, suggesting a hot, fast, enclosed fire, and this would be in agreement with use as a sweathouse or for some special processing, although it would not be compatible with use

for domestic cooking purposes.

A more abundant kind of feature at Shattuck Farm was the rock platform, a fairly large scatter of firecracked rock associated with some ash, some charcoal, little or no soil reddening, and domestic debris such as bone, sherds, chips, and often nut shells. Feature 3 at Locus A and Features 1 and 3 at Locus G are rock platforms. Seven were found at Bullen's sites, and such features have also been reported elsewhere in Massachusetts (Thorbahn 1982). Some of the "rock platforms" in the literature may instead be disposal piles of fire cracked rock cleaned from fires, as suggested by Barber (1979:157). However, the rock platforms at Shattuck Farm were made of rock that was dense and packed firmly in place in the soil, and Bullen describes similar features with neat rock layers, rather than the loose piles implied for Barber's sites. The charcoal associated with the rock platforms at Shattuck Farm was predominantly conifer wood, suggesting again a hot, fast, open fire which burned most of the fuel to ash. It seems most likely that the fire was used primarily to heat the rocks, which then did the "work" of processing something by smoking or drying. There are virtually no postmolds associated with these features at the Shattuck Farm loci or at Bullen's sites, suggesting that substantial scaffolds were not used with them. The food or other material being processed may have been placed right on the rocks, or wrapped in leaves, or perhaps flimsy racks that were not pushed far into the ground were used with these features. At the Hoffman site each platform was closely associated with a storage pit, perhaps for permanent storage of the refuse associated with processing, or for temporary storage of the materials being processed (Bullen 1949:20). This pattern was not found at Shattuck Farm, but excavations rarely proceeded very far beyond the bounds of the features themselves, so associated pits may have been missed.

In summary, the features at Shattuck Farm are generally similar to those

found elsewhere in the region. Some, primarily the red stains and pits, would seem to have been used for daily domestic tasks such as cooking food, warming people, and trash disposal. One feature may possibly be a sweathouse fire. The other features, especially the earth oven and rock platforms, were probably special processing features for preparing some food in large quantities. Given Shattuck Farm's location, anadromous fish are a likely possibility for such a food and the fact that all the "processing" features were close to the river would support this hypothesis. However, marsh resources may also have been processed on these features. In general, more precise determination of the functions of these features and others must await a better understanding of the meanings of their attributes.

#### SUMMARY

In this chapter I have attempted to be as explicit as possible as to the inferences that can and cannot be drawn from the remains excavated at Shattuck Farm, thus laying the groundwork for the statements to be made in the next chapter. I have argued for a very conservative approach to the interpretation of the plant and animal remains, as they may bear only a very tangential relation to the diets of the prehistoric inhabitants of this site. It is also difficult to draw generalizations from the stone tools because of small sample sizes. However, I have emphasized study of use wear as a means of drawing more information from these tools. More data were available for ceramics, and thus I attempted to establish some generalizations as to how ceramics were made and used, and how uses and manufacturing technique may have changed over time. Many of the conclusions of this particular exercise are admittedly speculative, and are meant to encourage further research to support or contradict them. Finally, features were discussed as an especially fertile kind of remain for functional analysis. The physical constraints on what

different combinations of elements can do, and also on what the resulting effects will be, make this an area ripe for study through both replication and empirical analysis.

Throughout this chapter there has been an obvious emphasis on functional analysis of archaeological remains rather than a typological approach designed to clarify the temporal meaning of the various tool and feature styles. Artifact and feature functions have never been totally neglected in New England, but they have also not been approached as thoroughly as they should be. Function is linked directly to human behaviours related to subsistence and economic organization. Furthermore, study of style, or social function, can be done far more effectively when we are able to control for technological function first.

Another viewpoint implicit in parts of this chapter but explicit in the next is that we must assume a certain amount of cultural diversity and variation over space as well as time. Human cultures are notably flexible and fine-tuned to their environments, and thus subsistence, technology, and settlement patterns should vary, even over small distances. Since humans also use their behavior and material culture to symbolize their social relations, we should assume even more variation in some aspects than in others. Archaeologists thus tend to believe that what they have found at their sites is "typical", and that other archaeologist's divergent findings are therefore wrong, and such assumptions have often led to arguments. Instead, we should be looking for and expecting variation, as well as broad patterns of similarity between sites. In terms of theory, we should be thinking about which aspects of culture are the most and the least likely to vary, and why. Surely this would provide a more useful framework for studying the past than the more normative frameworks in general use today.

Chapter 7      SHATTUCK FARM THROUGH TIME

INTRODUCTION

Previous chapters have detailed first what was actually found during our investigations at Shattuck Farm, and then the inferences that were drawn as to the functions of specific artifacts and features. This chapter will move further out on the limb of speculation and attempt to determine what people of different time periods were doing at Shattuck Farm. The discussion is clearly moving along a continuum from description to interpretation and even explanation. Unfortunately, however, the data from Shattuck Farm are primarily useful for suggesting models that require further testing, rather than for providing rigorous tests of hypotheses about prehistoric culture process.

For several reasons, the data from Shattuck Farm are not well suited for dealing with issues of change in subsistence, demography, or sociopolitical organization, or with many of the other topics that are of current interest and importance to New England archaeologists. The excavation samples were designed to be representative of the various parts of the site, but they are necessarily small and thus confidence intervals would be necessarily large. The loss of most bone and other organic matter makes even seasonality ambiguous in some cases, thus complicating a crucial aspect of any ecological or settlement pattern study. Plowing has disturbed the context for most areas, and compressed stratigraphy would have caused difficulties in most areas even if there had been no historic disturbance at all.

Above all, the loss of most of the kame terrace is a problem because we cannot know what remains, other than burials, were originally there. The locus descriptions have already shown that there was considerable horizontal variation at the site, so that a sample from one locus is not necessarily a valid sample for the whole site or for other loci. We were able to test the east and west

ends of the kame terrace in Loci C and H, but these areas differ from each other and there is no reason to believe that either is entirely typical of the missing center section. Since a crucial aspect of hypothesis testing is the ability to falsify alternative hypotheses (Platt 1964), the loss of a major area at this site presents a serious problem. Data from the remaining loci allow us to determine some of the activities that were occurring at the site, but we cannot entirely rule out other activities as well, because it could always be argued that they had taken place in the missing sections of the site.

Given all the data limitations expressed above, there is still much useful information available from Shattuck Farm, and we may as well use it as much as possible. To this end, one model of cultural adaptation is especially appealing because it has numerous and varied test implications. This is Binford's distinction between the two basic strategies he labels "foraging" and "collecting", and which correspond roughly to strategies of moving people between resource areas and moving resources to people, respectively (Binford 1980). These strategies are clearly only conceptual opposites, as every society must do a little of each, but the distinction is nevertheless one that archaeologists are finding useful (Cf. Thorbahn 1982).

According to Binford, foragers establish base camps and then go out from them to gather resources daily, on an "encounter" basis. When an area is depleted or other resources elsewhere come into season, the group moves on and establishes a new base camp near the new resource area. Archaeologically, such a strategy should result in a settlement pattern which includes many residential base camps and a few "locations", or areas where specific extractive tasks were carried out. These latter sites may often have low artifact densities and low archaeological visibility. There will be differences between the various base camps because activities vary from one season to another, but few functionally-specific large sites should be found. Since

base camps are where most processing, domestic, manufacturing, and maintenance activities take place, such sites should be expected to produce a wide variety of tools. There is little or no need for food storage with a foraging strategy, and thus storage pits should be rare although hearths and trash pits might be relatively common.

The forager strategy is seen most commonly among recent hunter-gatherers of the equatorial zone, in either desert or forest environments, but it is also found among some high-latitude groups (Binford 1980:16-17). Binford states that this adaptation is generally a response to a largely undifferentiated environment or one with large patches of resource homogeneity.

Collectors, on the other hand, tend to settle at residential base camps located near critical or bulky resources and then send out task groups to supply the group with specific resources not available in the immediate vicinity of the camp. The settlement system is basically more complex than for foragers; it includes residential base camps and locations, as does that of the foragers, but also "field camps", "stations", and "caches". Field camps are the temporary bases of operation for the task groups, stations are ambush or overlook camps, and caches are temporary storage places. Archaeologically, collectors' sites should show more variation in their sizes and contents than do foragers' sites, and they should often be clearly specialized. Storage pits should be common, as food storage is obviously an important part of this adaptation.

Among recent hunter-gatherers, the collector strategy is found primarily in the temperate zones and, according to Binford, is a response to temporal and spatial incongruity in the distribution of resources.

The following analysis will not attempt to identify each of the major temporal periods represented at Shattuck Farm with either of these archetypal extremes, but will suggest that shifts along the continuum identified by Binford did occur over time. I will also discuss the possible reasons for and

implications of these shifts.

Several assumptions are necessary, however, to link these settlement models to the Shattuck Farm site itself. I am assuming here that if the site were to be used by relatively large groups they would probably camp on the alluvial terrace at the center of the bend in the river, as this would have been the largest area of flat land at Shattuck Farm. This is also the best location for a long stay at the site because it is centrally located with regard to many resources. Smaller groups could camp on many of the smaller areas of level ground available around the larger site, and groups coming to the site for a specific resource would be expected to camp as close as possible to that resource. The implication, then, would be that camps on the alluvial terrace at Loci D and E are more likely to have been base camps, while settlements at the more peripheral loci would have been made by smaller groups of people using the site to procure specific resources and making short, but perhaps regularly repeated, visits.

It is also necessary to make assumptions about seasonality. Given the sparse faunal and floral data available from Shattuck Farm, it is really only possible to suggest whether occupation included the spring or fall. The site is unlikely to have been occupied in the winter because of the complete lack of protection from north winds, but summer would have been a very pleasant time at this site. The primary indicator of spring occupation here is the presence of anadromous fish remains. In addition, charcoal with early bark on it could only have been cut during the spring. On the other hand, the presence of nut shells and of the bones of birds and fur-bearing mammals is assumed to indicate that occupation of the site extended into the fall. Birds and mammals could be obtained year-round at this site, of course, but the former are most abundant in the fall and the pelts of the latter are in their best condition in the fall. Nuts can be assumed to have been harvested in the fall because

they do not ripen earlier and they quickly become wormy if allowed to lie on the ground (Barber 1979:372). Nuts could of course have been stored in the shell and eaten later in the year, though they would be very bulky to transport that way. In addition, carbonized nut shells could represent forest litter used as fuel for fires, rather than the remains of nuts gathered for food. Obviously, many of the above seasonal indicators are ambiguous by themselves, but when several are present together, attribution of seasonality becomes somewhat more secure.

Traditional period terminology is used here to discuss changes over time, with full knowledge of the inadequacy of any classification scheme that attempts to set neatly delimited cultural and temporal boxes on top of the rich diversity of activities in prehistory. These units are simply a convenient means of organizing the discussion, and the traditional terminology facilitates communication with archaeologists elsewhere in the eastern United States as well as comparison with previous literature dealing with the Northeast. No more nefarious purpose need be read into my use of this period terminology.

In the following discussion, a table of associations will be given for each time period for which materials were found in our excavations. On these tables, the columns represent provenience units (ranging from single levels in one meter squares to entire loci) which produced a radiocarbon date or at least one diagnostic artifact of the period, and which are judged to be relatively unmixed with other components. Rows represent material remains which are relevant to the determination of seasonality and/or activities, and an X is used to indicate the presence of that material in the given provenience unit. Actual quantities are not given because it is the general pattern of associations that is being considered; in nearly all cases, quantities are quite small.

Finally, a settlement pattern cannot be defined on the basis of a single site. Fortunately, data from a number of sites in close proximity to Shattuck

Farm, but occupying quite different topographic and ecological settings are available from Bullen's work (Bullen 1949). Major reports are also available for other Merrimack Valley sites including Neville (Dincauze 1976), Smyth Foster et.al. 1981), and Wheeler's (Barber 1982), and all of these are used for the comparative data they provide. Finally, survey data for the whole region are used in some parts of the discussion. However, it must be stressed that any pattern discernible at Shattuck Farm is assumed to be relevant to this district, and not necessarily to all of southern New England. It would seem wisest to assume that regional diversity existed, until we can prove otherwise.

#### PALEOINDIAN AND EARLY ARCHAIC (10,500-8000 years ago)

Although glaciers had retreated from the lower Merrimack area by about 13,000 years before present, the earliest traces of human occupation found thus far in the area, those from the Bull Brook site in nearby Ipswich, do not date much before 10,500 years ago (Dincauze 1974). Evidence from elsewhere in the Northeast suggests that the earliest inhabitants of this region were characterized by low population density, high mobility, and organization in small bands, and these traits, plus the changes in land forms that have occurred since, have combined to limit the archaeological visibility of both PaleoIndian and Early Archaic remains in New England. Dincauze and Mulholland have argued convincingly that the environment during this period was not particularly impoverished, but that it may have been rather unpredictable (Dincauze and Mullholland 1977:450). This was a time of dramatic changes; the climate ameliorated from near-Arctic to near-modern temperatures, sea level dropped and then rose again relative to the land, rivers found their ways around glacial obstructions and down new channels, and the various species of plants and animals migrated back into the area at different rates, establishing themselves in biotic communities considerably different from any known today. Pollen

studies indicate a gradual change from tundra conditions to open spruce parkland to mixed coniferous and deciduous forest, probably with considerable local variability in forest composition (Snow 1980:114-117).

Research at other New England sites still has not resolved the question of PaleoIndian subsistence, although Snow probably voices the majority opinion when he states that the PaleoIndian economy was focussed on large migratory animals such as caribou, mammoth, or mastodon (Snow 1980:151). Dincauze is a prominent advocate of the alternative view that PaleoIndians were generalist foragers (Dincauze 1981). Early Archaic people would not have had access to the large animals, and are generally considered to have been broad-niche generalists, exploiting a wide variety of resources because no one resource was dependable or abundant enough to allow specialization (Snow 1980:170).

Neither the PaleoIndian nor the Early Archaic periods are definitely represented at Shattuck Farm thus far. Two fluted points are in collections from the general Andover area, but neither could be attributed securely to the Shattuck Farm site. The Otis Shattuck collection in the museum of the North Andover Historical Society did include two felsite bifurcate-base projectile points and one Kirk-like stemmed projectile point of felsite (Appendix I). While the raw materials and the proportions of point types in that collection agree with the others from Shattuck Farm, lack of documentation means that we cannot be certain that some artifacts did not come from other sites. In the case of these early point types, which are found only in this one collection, I prefer to be conservative and say only that they might have come from Shattuck Farm. Low frequencies of Early Archaic points at the Neville site (Dincauze 1976) and the Smyth site (Foster et.al. 1981) support Dincauze and Mullholland's suggestion that most major rivers were close to their present courses by Early Archaic times, and that some of the attributes that distinguished these locations in latter times were now present (Dincauze and Mullholland 1977:449).

However, it is possible that the Merrimack had not yet cut down to the level of Peters Falls by this period, since these falls are very shallow. In any event, the lack of data from Shattuck Farm for these periods makes speculation as to settlement system types senseless.

#### MIDDLE ARCHAIC (8000-6000 years ago, or 6000-4000 BC)

As the climate of southern New England continued to improve, mixed conifer-hardwood forests dominated the area, and plant and animal communities became more stable and dependable than they had been previously. The coastline was still far from its modern position (Dincauze and Mulholland 1977) but most rivers were running close to their modern baselines. The falls at Amoskeag had certainly formed by the early part of this period (Dincauze 1976).

The Middle Archaic is represented at many sites in southern New England, suggesting a sizeable, well-established human population in the area. Group territories appear to have been somewhat more restricted than in previous periods (Bullen 1949, Dincauze and Mulholland 1977).

Not surprisingly, the Middle Archaic is well represented at Shattuck Farm as well. As Table 67 indicates, 79 of the projectile points in the various collections studied from the site were typed as Middle Archaic forms. Unfortunately, however, no Middle Archaic materials were recovered in our excavations. A possible Stark point with its base broken off was recovered from the "Wet site", Locus F, but as discussed previously in Chapter 5, context is not clear for this locus. Of the points in collections for which collectors could remember provenience, all but one of the Middle Archaic points were found on the alluvial terrace at Loci D and E (Appendix I). One Merrimack point was said to be from the kame terrace near Spindle's Creek. However Fred A. Luce, who seems to have collected a great deal on the kame terrace does not have any Middle Archaic points in his collection (Appendix 1). Taking all these factors into account,

Table 67. Projectile Points in Shattuck Farm Collections\*

Point Type	% Felsite	% Quartz	% Argillite	% Chert	N	% Total	% by Time Period
Neville (+Neville Var.)	87.2	5.1	7.7		39	3.6	
Stark	71.0	6.4	22.6		31	2.9	7.4
Merrimack	88.9		11.1		9	.8	
Otter Creek			80.0	20.0	5	.6	
Vosburg				100.0	2	.2	
Normanskill	50.0		50.0		2	.2	
Brewerton	79.0	6.4	6.4	8.1	62	5.8	83.9
Squibnocket triangle	55.3	44.6			421	39.2	
Small stemmed	27.4	71.5	1.1		361	33.6	
Susquehanna tradition	79.2	4.2	12.5	4.2	24	2.2	
Orient	79.2		20.8		24	2.2	
Meadowood	64.3			35.7	14	1.3	
Rossville	60.0	40.0			5	.5	2.0
Adena	100.0				3	.3	
Greene	100.0				4	.4	
Fox Creek	92.8	7.1			14	1.3	1.8
Jack's Reef				100.0	1	.1	
Madison			50.0	50.0	2	.2	4.9
Levanna	88.2	7.8	3.9		51	4.7	

\* These figures are based only on the data in Appendix I; excavated projectile points have not been included. As discussed in Chapter 6, some point types may have been used during more than one time period, and a considerable proportion of the felsite "Squibnocket triangles" may actually be Late Woodland forms (Luedtke 1983).

the primary area of Middle Archaic occupation at Shattuck Farm appears to have been the central section of the alluvial terrace.

Because no materials were located in situ, little further can be said about the Middle Archaic occupations at this site. Under the assumption discussed at the beginning of this chapter, the location of the main occupation suggests that Shattuck Farm was used for a base camp during much of the Middle Archaic, with the possibility that use may have shifted somewhat during the later part of this period. It is interesting to note that Dincauze suggests that use of the Neville site may also have changed near the end of the Middle Archaic, perhaps from a spring to a fall occupation (Dincauze 1976).

Dincauze and Mulholland describe the Middle Archaic settlement pattern as one of small sites oriented toward seasonally abundant resources, including spring fisheries, and this implies a foraging strategy. Snow states more explicitly that the Middle Archaic settlement pattern consisted of spring base camps at falls on rivers, summer camps at freshwater locations, and winter hunting camps inland (Snow 1980:183). He also says that there are many special purpose camps with a narrow range of activities represented, but does not give the data to support this assertion, which would imply a strategy more toward the collector end of the continuum.

Looking just at the lower Merrimack, McManamon found differences between the Middle Archaic assemblages from some of Bullen's sites, but it is not clear whether these differences represent seasonal or structural variation (McManamon 1980). Foster's Cove site has the largest Middle Archaic assemblage from any of Bullen's sites, and McManamon assigns to this occupation a variety of scrapers, hammerstones, knives, projectile points, an ulu, and a drill, along with a hearth, a small charcoal pit, and two cache pits. This variety of tools and features suggests a base camp to me. Thus, the data from southern New England as a whole are interpreted differently by different archaeologists, but the data from

the lower Merrimack suggests a Middle Archaic adaptation toward the forager end of the continuum. It is interesting to note that Thorbahn came to similar conclusions for the Taunton area, using a different set of test implications for the Binford model (Thorbahn 1982).

#### LATE ARCHAIC (6000-2500 years ago, or 4000-500 BC)

This is one of the most intriguing periods in southern New England prehistory, both because there is a great deal of archaeological data available for it and because the period appears to have been unusually complex and dynamic. It is also a period of environmental change, although the exact parameters of the changes are not clear. The major area of topographic alteration for this period is the coast, where the post-glacial transgression brought sea level close to the modern coastline by the end of the Late Archaic (Barber 1979). As the shorelines stabilized, extensive shellfish beds developed near their present positions, and the expansion of the continental shelf probably favored anadromous fish populations as well. Inland, New England was covered with forest composed of most of the same species as are in the area today, but in proportions which varied as the climate changed.

The climatic shifts themselves are still obscure, though there seems to be good agreement that temperatures of both the ocean and the atmosphere warmed steadily until about 3000-3500 years ago, reaching average levels higher than those of modern times. Temperatures then gradually became cooler, with marked cooling after about 2500 years ago. Changes in precipitation patterns are less clear. Thorbahn has good evidence that the water table was considerably lower in southeastern Massachusetts during this period, with ponds and marshes greatly reduced (Thorbahn 1982). This finding has not been confirmed for the northern areas of Massachusetts as yet, and the presence of turtle remains for all periods at Shattuck Farm suggests that the marsh was in existence there by Late

Archaic times. The distribution of materials near the western edge of the marsh in Locus E also suggests that the marsh was not greatly reduced, and perhaps even a little larger than at present.

Thorbahn has interpreted the period from 5000-3500 years ago as one of spatio-temporal heterogeneity of resources, and of considerable environmental stress. Mulholland on the other hand interprets data from pollen diagrams to indicate that this period was one of minimum vegetational species diversity, and therefore of considerable stability and predictability (Mulholland 1979). Both views may ultimately be reconcilable, but at this point we can't say for certain whether New England during the Late Archaic was a paradise or a purgatory. All we can say for certain is that it was different from preceding and succeeding periods.

Human cultural responses to these environmental changes are also not clear. The Late Archaic has often been interpreted as a time of high population density in New England (Dincauze 1974) and certainly an enormous number of sites have produced Late Archaic projectile points. As discussed in Chapter 6, some of these point types may actually have been used into later periods, but there are still a great many well dated or undoubted Late Archaic sites. There were also a wide variety of projectile point styles in use during this period and debate continues as to whether this means that a number of distinct cultural groups with different adaptations occupied the region at the same time, or that a variety of projectile point styles and technologies were taken up at different times by essentially the same population.

Before it was plowed and disturbed, Shattuck Farm might well have been an excellent site at which to study the question of the relationship between the various Late Archaic projectile point types. Virtually all the Late Archaic point types known for southern New England are represented in collections from Shattuck Farm, and small stemmed points and Squibnocket triangles make up the

vast majority of all the projectile points found there (Table 67). Clearly this site was used intensively and regularly throughout the Late Archaic period.

Data from both the excavations and the collections suggest that the primary area of occupation at Shattuck Farm during the Late Archaic was the alluvial terrace. Because all this area was so thoroughly plowed, unfortunately, we only find Late Archaic materials in situ at considerable depths and these materials may not be representative of the entire original Late Archaic assemblages. In fact, the sparseness of these remains suggests that they may often be materials that have worked their way down from the main occupation levels, which may have partially extended into what is now the plow zone. Table 68 shows the associations between various remains and provenience units with diagnostic Late Archaic artifacts such as small stemmed points and quartz Squibnocket triangles. The frequent occurrence of bird bones and nut shells, as well as a find of beaver bone (Appendix I) all suggest fall occupation of the site, and the fish remains from Locus E could be either spring or fall species. Other times of year cannot be definitely ruled out, however, and I suspect occupations may have included spring, summer, and fall. Rather surprisingly, debitage is not abundant in most of these provenience units, but again this may be the result of disturbance. It is interesting to note that the only ground stone tool fragments found in excavations at Shattuck Farm were in Late Archaic association; Bullen found the same pattern of association at his Shawsheen valley sites (Bullen 1949:76-77). It appears that more heavy woodworking took place in this area during the Late Archaic than in later periods, perhaps as a result of a shift from dugout to birchbark canoes.

Thorbahn interprets that data from his Taunton area sites as indicating that there was a shift from forager to collector strategy about 4000 years ago, as a result of the spatio-temporal inhomogeneity of resources resulting from the environmental conditions described above (Thorbahn 1982). The evidence

Table 68. Late Archaic Associations

Material	A N5W29 Fea. 2	A N12W5 Fea. 4	D N3W84 L. 8-10	D N6W85 L. 5-7	D N9W78 L. 7-9	D N10W54 L. 8-9	E TP 2 L. 6-12	E TP 3 L. 7-9	E TP 5 L. 6-14	E TP 6 L. 6-10	E Vossburg Pit (Appendix I)
Nut Shell	X			X			X		X		
Shell											X
Fish							X		X	X	X
Turtle			X	X	X		X	X	X	X	X
Snake							X	X	X	X	
Bird				X			X			X	
Mammal				X		X	X		X		X
Projectile Point			X	X	X	X	X		X		X
Biface					X	X					X
Scraper										X	
Drill											
Hammerstone			X								
Anvil			X								
Ground Stone Fragment			X						X		X
Ulu				X							
Graphite											
Other		charred pine cone & juniper berry			much quartz debitage						
Feature	Fea. 2 charcoal pit	Fea. 4 red soil area		Fea. 3 rock platform					Fea. 3 refuse pit		refuse pit

from Shattuck Farm also suggests that a forager strategy was used throughout the early part of the Late Archaic. Most of the early Late Archaic sites in this region appear to be base camps, rather than the variety of different site types one would expect with a collector strategy, according to Binford's model. Settlements appear to be bigger than single family or task group size, indicating they were occupied by somewhat larger groups. At Shattuck Farm, the location of most of the Late Archaic materials on the central alluvial terrace fits the model of occupation by large groups for fairly long periods of time. In addition, a small special purpose task area may be represented by Locus A. One could argue that Shattuck Farm was simply the base camp for a group who collected from a territory extending around the site, but several of Bullen's sites also appear to be base camps, despite the fact that they are located very close to Shattuck Farm and in quite different topographic settings.

At both Shattuck Farm and at Bullen's sites there appears to be a greater diversity of artifact types during the Late Archaic than during later periods, and this is taken to be indicative of the wider range of activities to be expected at a base camp as opposed to a special purpose camp (Table 68). For example, Late Archaic levels at Foster's Cove produced a celt, an ulu, several drills, hammerstones, a grooved hammer, a chopper, several shapes of knives, gouges, and a variety of scrapers. On the other hand, Dincauze interprets the Late Archaic remains at the Nevill site as being those of a temporary special purpose camp, although it is always possible that a Late Archaic base camp existed nearby in that once-rich archaeological district around the Amoskeag falls.

Finally, the Late Archaic levels at Shattuck Farm and at Bullen's sites have considerable evidence of processing activities but little evidence of storage, and this is again the pattern expected with a forager adaptation. Shattuck Farm produced a rock platform and three small refuse pits and one small fire area, while Foster's Cove had three rock platforms, several "scattered rock

areas", and one pit (Bullen 1949:25).

In general, then, for most of the Late Archaic Shattuck Farm was used as a base camp by foragers, perhaps during most of the warm part of the year. Activities include hunting, fishing, collecting and processing of plant and animal products, woodworking, and a variety of other maintenance activities.

Later Late Archaic projectile point types, including Susquehanna tradition and Orient points, were not found in situ during our excavations, although they are well represented in the collections from Shattuck Farm (Table 67). It is quite possible that this period saw a change from a foraging to a collecting strategy, paralleling that suggested by Thorbahn for the Taunton River area (Thorbahn 1982). Significantly, Bullen found numerous Susquehanna tradition points at the Hoffman site where they were associated with stone platforms and storage pits (Bullen 1949:21). The steatite bowl fragment found during our survey at Shattuck Farm and the cremation burial described by Kidder (Chapter 3) were both located on the kame terrace, suggesting that the location of activities during the later part of the Late Archaic may have been different than it was in the earlier part of this period. The evidence is admittedly scanty, but it does suggest that the major change in the use of the Shattuck Farm site which is so obvious for later periods began sometime during the Late Archaic.

#### EARLY WOODLAND (2500-1600 years ago, or 500 BC to AD 350)

There is considerable evidence from pollen studies for a marked cooling of the climate of New England from about 3000 to 1000 years ago (Braun 1974), and Thorbahn found that the water table in his area was rising again during this period, suggesting an increase in precipitation as well (Thorbahn 1982). These conditions could have had a deleterious effect on some plant species, perhaps most significantly certain nut trees, and this in turn could have created considerable stress on human populations. Thorbahn reports an additional

change in the pollen profile for his area about 2000 years ago, when more shrubs and "edge" trees became apparent at the expense of oak and hemlock. This change may be the result of climatic conditions, but is perhaps more likely to have been caused by human intervention in the form of forest clearance or burning. Thorbahn suggests a possible association of this change with the beginnings of horticulture in this region, and Snow labels this period the "Early Horticultural" (Snow 1980). However, there is not yet a shred of evidence for horticulture in New England before the Late Woodland period. Even in the Midwest, where cultigens have been found in very early contexts, they are clearly not an important part of subsistence until Late Woodland times (Ford 1979). It is difficult to imagine that Early Woodland people in New England would have undertaken major environmental alterations for the sake of a marginal activity, and I suggest we look to changes in hunting and gathering practices to explain this environmental shift.

The climatic changes that are documented had a predictable effect on subsistence strategy; "Given the arguments presented here, we should therefore see a reduction in residential mobility and an increase in storage dependence as the length of the growing season decreases." (Binford 1980:15). Decreased reliability of resources and increased spatio-temporal variation in resource availability would have had a similar effect. Among recent hunter-gatherers the collector strategy prevails in higher latitudes, so it is not surprising that it became dominant in New England now.

Dincauze reports a shift in settlement toward the coast for this period (Dincauze 1974:50), and although recent research suggests this shift was not as dramatic as first suggested, it is what would be expected according to Binford's model. People should settle near the resource with the greatest bulk demand, and perhaps the greatest dependability, and procure other resources by means of special task groups. Shellfish and/or marine fish and mammals may have

been the resources attracting people to coastal locations for their base camps, though they continued to exploit inland resources as well.

Environmental change was probably not the only factor promoting the shift toward a collector strategy during this time period. Binford states that any condition that increases the number of critical resources should increase the probability of incongruities in their distributions, and thus select for a collecting strategy. One such factor would be the introduction of ceramics, which add clay to the list of necessary resources. Also, the use of ceramics allows a greater use of small foods such as seeds, nuts, and small fish, and any or all of these could now have become critical resources.

As an aside, the introduction of ceramics may well have restructured male and female work roles, also. It has been assumed that women made ceramics, and cross-cultural studies of other hunter-gatherers suggest that women are also the most likely to have collected small foods such as seeds and nuts. If a greater proportion of the subsistence during the Early Woodland was now provided by women, the division of labor must have changed. Perhaps men began to do a greater proportion of the fishing, or perhaps more of their time was spent in trade and between-group interactions.

At Shattuck Farm the Early Woodland period is moderately represented in the projectile point assemblages from the site (Table 67), and in ceramics from the excavations. The excavation data also suggest that the Early Woodland use of the area was strongly localized; nearly all the Early Woodland vessels came from the kame terrace remnants, Loci C and H, with only a stray sherd or two from the alluvial terrace. Table 69 shows the remains associated with Early Woodland vessels, and while there is not a great deal of evidence the indications do point to fall occupation. The lack of fish is interesting and agrees with the primary location of Early Woodland settlement, away from the river. The location suggests also an interest in non-riverine resources, perhaps

Table 69. Early Woodland Associations

Material	C NOW9 L. 7-8	C S9W12 L. 3-4	C S20E3 L. 4-6	H N33W22 L. 5-6	H N42WI6 L. 4-8
Nut Shell	X				X
Shell					
Fish					
Turtle	X	X		X	
Snake					
Bird			X		
Mammal		X	X		
Projectile Point					
Biface		X			
Scraper		X			
Drill					
Hammerstone				X	X
Anvil					
Ground Stone Fragment					
Ulu					
Graphite					X
Other					
Feature	Fea. 1 pottery concentration				

small seeds that would require cooking in the vessels that were brought along to the site. The location and the limited range of artifacts all suggest use of the area by task groups exploiting the resources of this location and bringing food back to base camps elsewhere. The Early Woodland is not well represented at Bullen's sites, and this again is in agreement with a settlement system in which people lived primarily on the coast and sent task groups upriver for specific resources. From the evidence available, it appears that Early Woodland people came to Shattuck Farm in the fall to hunt and collect foods and other materials, and that they spent other seasons elsewhere.

#### MIDDLE WOODLAND (1600-1000 years ago, or AD 350-950)

The Middle Woodland period in New England appears to have been a time in which there was an intensification of trends that began in the Early Woodland or a little before. The climate was still somewhat cooler than at present until the end of this period, but it was probably relatively stable. People had had time to adapt to the cooler environmental conditions, population was growing, and there was a continued coastal bias to settlement in the region (Dincauze 1974).

There is also continued evidence for use of a collector strategy, but with an emphasis on greater productivity. Snow states that storage pits became more common during the Middle Woodland, indicating more processing for future consumption (Snow 1980:282). Such storage pits were not definitely found at Shattuck Farm (although Feature 2 at Locus C could be of Middle Woodland age) or at Bullen's sites, but most of the latter sites apparently saw only minor use by people during this period. The large roasting and smoking features at the Wheeler's site and at Shattuck Farm are evidence of the trend toward more bulk processing of foods (Barber 1979).

At Shattuck Farm the Middle Woodland period is not well represented among the projectile points, but it is quite well represented in the ceramic assemblage,

with Middle Woodland vessels identified at Loci C, D, E, G, and H. There is also a Middle Woodland radiocarbon date from Feature 1 at Locus B, a hearth. Camps are obviously in a wide variety of locations around the site, suggesting use by various task groups involved in the procurement of very specific resources.

In particular, Locus G is nearly pure Middle Woodland, and is apparently a small sturgeon fishing camp occupied in the spring and reoccupied at least once. I see this locus as a model for the other Middle Woodland camps at Shattuck Farm, though the latter are not as clear because of later and earlier admixture. In contrast to previous periods, there is no evidence for fall occupation in the Middle Woodland areas (Table 70). Also, Middle Woodland vessels are most abundant to the east, near the falls, suggesting that fish were of considerable importance. This pattern is different from that found in Maine, where Middle Woodland people appear to have spent spring near the coast, although sturgeon were taken in both areas (Bourque 1973). The lack of variety in artifact types, despite the relatively large area excavated, also supports an interpretation of Middle Woodland settlements at Shattuck Farm as special purpose camps. Only five types are present, as opposed to seven for Late Archaic units, and the most common tool is the hammerstone, a processing tool. Dincauze notes a similar lack of variety in the Middle Woodland artifacts from the Neville site (Dincauze 1976:138).

Middle Woodland assemblages in Massachusetts have produced considerable evidence for long distance trade; occasional "Hopewellian" artifacts suggest links to the west, while most of the Pennsylvania jasper found in eastern Massachusetts sites appears to have entered the area during this period (Luedtke 1982). The wide variety of lithic raw materials found at Shattuck Farm Locus G, the Wheeler's site, and the Middle Woodland levels at the Neville site are all further indications of this trade network. This apparent increase in the intensity of regional interaction between groups may in part be the result of

Table 70. Middle Woodland Associations

Material	B Fea. 1	D N4W89 L. 8-9	D N5W55/56 Fea. 5	G all	H N4W16 L. 3	H N42W16 L. 1-3
Nut Shell						
Shell						
Fish				X		X
Turtle				X		
Snake						
Bird						
Mammal				X	X	
Projectile Point	X			X		
Biface				X		X
Scraper				X		X
Drill				X		
Hammerstone	X			X		X
Anvil						
Ground Stone Fragment						
Ulu						
Graphite				X		X
Other	much quartz debitage					
Feature	Fea. 1, hearth	Fea. 2, red soil area	Fea. 5, earth oven	Feas. 1, 2, 3, 4, 5: 19 postmolds, 2 red soil areas, 1 ash pit, 1 FCR concentration		

the shift in work patterns suggested above for the Early Woodland. Trade may have provided goods important in social and religious contexts, and is also likely to have included food and thus functioned to increase subsistence stability by redistributing resources.

The trade network is unlikely to have been associated with regional political integration; ceramic evidence points instead toward strongly marked stylistic differences between areas, suggesting that they were occupied by socially and politically autonomous units. As discussed in Chapter 6, there is some reason to believe that regional ceramic style traditions became established now, with differences discernible between the lower Merrimack and the Boston Basin. Kenyon has also identified differences between the Middle Woodland ceramics of the upper Merrimack, the lower Merrimack, and the Concord drainage basins (Kenyon 1983). Again, it is assumed here that ceramic style differences are used to signal social affiliation, in the context of regular social interaction. Further evidence of such interaction may be provided by the apparent increase in graphite use during this period. Both at Shattuck Farm and at Bullen's sites, graphite is very strongly associated with Middle Woodland materials, although it is also found occasionally in earlier and later contexts. This pigment could have had many uses, but during the historic period it was used most strikingly for body paint. As costume and personal decoration have been identified as especially likely areas for social signalling (Wobst 1977), increased use of graphite may be one more indication that Middle Woodland groups were autonomous but did not function in self-sufficient isolation. Instead, they appear to have engaged in regular interaction on several levels, setting the stage for major changes in subsistence and social organization that became evident in the next period.

LATE WOODLAND (1000-350 years ago, or AD 950-1600)

Climate, flora, and fauna can all be considered essentially modern for this period in New England. Pollen profiles indicate some evidence for progressive forest clearing (Thorbahn 1982), and by the time Europeans arrived in the area broad meadows existed in many areas and the underbrush was kept cleared out by regular burning (Wood 1977:38).

For southern New England as a whole, the earlier part of the Late Woodland period does not appear to be markedly different from the Middle Woodland in terms of subsistence or site location (Dincauze 1974:53). As discussed in Chapter 6, ceramics do show changes during this period which are likely to reflect an increased emphasis on cooking plant materials. Ceramic evidence also suggests a considerable occupation at Shattuck Farm during this period; shell tempered vessels make up the single largest category here. Unfortunately, it is nearly impossible to isolate this period either horizontally or vertically at Shattuck Farm. Late Archaic materials and features are commonly found below the plow zone at Shattuck Farm, and some Early Woodland and Middle Woodland deposits are also undisturbed. With very few exceptions, though, all early Late Woodland artifacts were found in the plow zone. Also, occupation during this period appears to have been focussed on Loci D and E, though some shell tempered sherds are found at other loci as well, and thus the period is not spatially distinct from other time periods. Therefore, Table 71 should be considered the most tentative of all the tables of associations.

Location of the majority of early Late Woodland materials near the river and near Spindle's Creek suggests that the area was used by large groups exploiting riverine resources. However, no fish remains were found in clear Late Woodland association, and bird bone and nut shell were. One rock platform probably dates to this period. Using the assumptions discussed previously, the location of settlement suggests that Shattuck Farm was a base camp for early

Table 71. Early Late Woodland Associations

Material	D N4W89 L. 3-7	D N6W85 L. 1-4	H NOE10 L. 4
Nut Shell	X	X	X
Shell			
Fish			
Turtle		X	
Snake			
Bird	X	X	
Mammal	X	X	X
Projectile Point			
Biface		X	X
Scraper			
Drill			
Hammerstone			X
Anvil			
Ground Stone Fragment			
Ulu			
Graphite			
Other			
Feature	Fea. 1, rock platform		

Late Woodland people, but all other evidence is lacking. Early Late Woodland ceramics were also found at Bullen's Hoffman and Foster's Cove sites, where they were associated with a limited range of stone tools and numerous features, including fire areas, pits, and postmolds. In general, the picture of adaptation for this period remains unfortunately murky.

Between AD 1000 and 1200 major changes in many aspects of Late Woodland life began to occur, perhaps as a result of the addition of horticulture as a subsistence technique. Although cultigens may have entered New England earlier, they have not been found in dated context earlier than AD 1160 (Ritchie 1969:52), and they are very unlikely to have played an important role in the diet before this period. However, the introduction of frost-resistant varieties of corn allowed the adoption of cultigens as a reliable source of food in the northeast, and this brought about changes in subsistence, territorial organization, and technology (Luedtke 1980a). New England Indians apparently did not become completely sedentary, but there may have been less mobility, and large quantities of corn were stored in large pits near the fields (Luedtke 1980b). As discussed in Chapter 6, this reliance on corn selected for increased cooking efficiency in ceramic vessels, which became thinner, more globular, and more carefully made. Decorative styles did not change markedly during most of this period, though, and lower Merrimack ceramics continued to be different from those elsewhere in New England. As discussed previously, there is at least the possibility of incipient specialization in ceramic production, perhaps associated with further re-organization of the division of labor. During the historic period, all crops except tobacco were planted and tended primarily by women (Williams 1973:103), suggesting a further expansion of women's roles in the provisioning of their families. Men's activities may have shifted further toward participation in interactions between groups, including politics, trade, and warfare.

This is almost certainly the period during which a significant sociopolitical change occurred, from organization based on egalitarian and autonomous groups to organization based on hereditary leadership and regional integration. One aspect of this change may be the brief appearance of ossuary burials such as the one recently discovered on Cape Cod which produced a radiocarbon date of AD 1025 (Bradley et al. 1982). Among certain other groups in the Northeast, ceremonial reburial of the dead in ossuaries was an important ritual which enhanced social bonding between village groups (Heidenreich 1978:374-375), and which may also have served to validate succession in leadership. It is possible that ossuaries in southern New England served a similar function. Later, when the principle of hereditary leadership was presumably more secure, individual burial became standard (Simmons 1970).

At Shattuck Farm the thin, dark ceramics of the later Late Woodland period are prominent at Loci A and B, and are also found in small quantities everywhere except Locus G. This distribution, and the limited range of tools and features (Table 72), suggests that Shattuck Farm was again being used as a special purpose campsite and not as a major base camp. Even in Locus D, ceramics of this period are highly localized toward the west end of the locus. The presence of bird bone and nut shells may indicate use of the area primarily in the fall, and most of the ceramic vessels from this period are located toward the west end of the site, away from the falls. These facts suggest that spring fishing was not undertaken at the Shattuck Farm site during this period. Bullen's later Late Woodland components also appear to be small camps used for specific purposes (Bullen 1949).

There is no evidence for farming at Shattuck Farm; no hoes have been reported in collections, and no cultigens were found in flotation samples. If farming did occur at the site it may well have taken place on the kame terrace, because the soils there are slightly better and the somewhat higher

Table 72. Later Late Woodland Associations

Material	A N1W34 L. 3-4	A N2W20 L. 2-4	A N12W23 L. 2-4	A N22W13 L. 3-5	B S13E12 L. 1-3
Nut Shell					
Shell					X
Fish					
Turtle	X				X
Snake					
Bird	X				X
Mammal					
Projectile Point			X		
Biface					
Scraper		X			
Drill					
Hammerstone					
Anvil					
Ground Stone Fragment					
Ulu					
Graphite					
Other				flake knife	
Feature				Fea. 5, red soil area & ash pit	Fea. 2, red soil area

ground may have afforded some protection from frost damage. Again, because this part of the site has been largely destroyed, we cannot rule out any possibilities for activities there. I would suspect, however, that most farming took place closer to the coast. Moorehead states that he found 20 granite boulder mortars between Lawrence and the coast (Moorehead 1931:20), suggesting that this was an area where considerable processing of corn took place. Traces of Indian corn fields were still visible south of Lawrence in the nineteenth century (Dorgan 1918:8). If major farming villages existed further inland they are most likely to have been located near the Pawtucket falls and perhaps at Amoskeag or near Concord, New Hampshire. These are all far more strategic locations for major settlements than is Shattuck Farm, and all are associated with Indian farming in the early historic period.

Thus, during the Late Woodland period use of Shattuck Farm appears to have shifted toward the fall, with this trend especially clear for the later Late Woodland. It is less possible to make definitive statements about the early Late Woodland than it is for any of the other time periods, even though occupation of Shattuck Farm appears to have been heavy during this period. Shattuck Farm may have been a large base camp for early Late Woodland people, or it may have been used by large groups in the spring and by smaller groups in the fall. Later, there is a decided shift to fall occupation by small groups.

Interpretation of the Late Woodland period suffers especially from lack of knowledge of how the kame terrace was being used, and also from lack of information about the Pawtucket Falls area. The distribution of deaths from Contact period diseases and other historic period records suggest that a political boundary may have existed somewhere in the Lowell area. If that boundary lay east of Lowell, Shattuck Farm would then become an attractive fishing place for people from the coast. If the boundary lay west of Pawtucket, Shattuck Farm would be of little interest as a fishing camp but perhaps of

considerable interest for other resources. Again, social and political factors may have been as important as ecological factors in determining how this particular site was used.

#### CONTACT PERIOD (AD 1600-1750)

For this period we have very little archaeological data but considerable documentary data to work with. The latter are complicated by a lack of detailed primary sources dealing with the lower Merrimack, and by the often wildly contradictory accounts of the period in town histories of the region. Thus, parts of the following discussion are admittedly speculative.

Champlain entered the mouth of the Merrimack in 1605 but did not describe the area in detail (Champlain 1907). John Smith is also disappointingly terse regarding his visit in 1616: "They report a great River, and at least thirtie habitations, do possesse this countrie. But because the French had got their Trade, I had no leisure to discover it." (Smith 1910:204). Thus, reconstruction of the life of the early Contact period must be based on scraps of information from a number of sources.

At the time when Europeans first settled in New England, the Merrimack valley from Plum Island to Amoskeag Falls appears to have been inhabited by horticultural peoples speaking dialects related to Massachusetts (Salwen 1978) and probably closely allied, socially and politically, with other Massachusetts speaking groups to the south. Above Amoskeag lived groups speaking Western Abenaki dialects (Day 1978). The lower Merrimack groups were apparently friendly with their neighbors inland, but less so with their Eastern Abenaki neighbors to the northeast, with whom they may have been at war (Salwen 1978:170). Snow, however, argues that Massachusetts speaking people had been expanding north along the coast into the lower Merrimack just at Contact period times and that they fought with nonhorticulturalists on the upper Merrimack, forcing

the latter into palisaded villages (Snow 1980:333). His evidence for this model is unclear, and I am inclined to side with Salwen because of the archaeological evidence for ceramic continuity from Middle Woodland through Late Woodland in the lower Merrimack.

There is also disagreement among archaeologists and among the earliest historians as to the early Contact period settlement pattern. There may simply have been a certain amount of regional variability in settlement pattern, and group movements may even have varied from year to year depending on a variety of social and environmental factors. All models agree on several elements, however. First, there were regular seasonal movements of residence for most people. Second, there was seasonal agglomeration and disaggregation of groups, so that sizes of settlements varied over the year. Third, some of the movement was from the coast to the inland areas and back again.

The village was probably the basic sociopolitical and subsistence unit in this settlement system, but villages may have varied in size. The inhabitants of a village also may not have any single name consistently applied to their group. Residence groups were usually referred to by the name of their current leader, or by the name of the location they currently occupied. It is certainly true that all the so-called tribal names for this area refer to topographic features (Salwen 1978:174). Thus, the "Pawtuckets" or "Pentuckets" were the people camped at Pawtucket falls, and may not have ever referred to a coherent and consistent political unit. This is undoubtedly a cause of much of the confusion and disagreement in local histories as to the names of the groups inhabiting this region.

Additional confusion may be due to the fact that political organization in Contact period New England was not actually as hierarchical and hereditary as it was sometimes described by Europeans, who were likely to emphasize the organizational principles they were most familiar with. In my reading of the

literature, hereditary principles seem to have been important for determining leadership on the village level, but affiliation processes reminiscent of "Big Man" political systems appear to have been important at supra-village levels of organization. In other words, individual leaders gained ascendancy over whole regions and even over different dialect groups not through any hereditary right, but through a combination of intelligence, talent, personal charisma, ability to mobilize large numbers of warriors, and ability to manipulate relations with other groups and with Europeans. These "grand alliances" would normally have died with the leaders who forged them, though some became reified by the Europeans, who generally preferred to deal with stable hierarchical systems.

Besides their shifting political alliances, Indian villages in southern New England were also bound together by active trade or exchange networks, which appear to have operated along two axis. First was a coastal axis, which may have extended along the entire northeast. Morton states that most Massachusetts men carry "mineral stones to make fire, and they get these from the Piquetteenes, south of all the New England plantations, through trade (Morton 1883:172). Wood states that pots, wampum, stone pipes, and European trade goods moved from the Narragansetts to their neighbors to the north (Wood 1977:91). Earlier in the sixteenth and seventeenth centuries, European trade goods appear to have been moving from north to south along the coast, in exchange for horticultural products (Salwen 1978:166).

The second axis of trade was from the coast to inland areas, and resulted in part from differential distributions of some resources. Thus, wampum and shell were produced on the coast and traded inland for chestnuts, maple bowls, and perhaps furs (Morton 1883). While chestnut trees do grow near the coast, they bear few nuts there (Emerson 1846:165). Other ecological differences undoubtedly provided a rationale for this trade.

Though the lives of the native inhabitants of the lower Merrimack were already being altered by trade with Europeans in the early Contact period, their culture was far more deeply affected by the demographic catastrophe which resulted from the introduction of European diseases. We don't know when these diseases first began to affect populations in this area, but the first well documented plague is that of 1616-1617, which was said to have caused the deaths of up to 90% of the people living within 20 to 30 miles (30 to 50 klm) of the coast (Smith 1910:259, Mitchell 1930:162). The smallpox epidemic of 1633 killed many of those who had survived the earlier plagues in this area (Winthrop 1908:111-118). As a result of these deaths, of attacks by Eastern Abenaki (Winthrop 1908:66), and of flight by many survivors towards the west and south (Johnson 1919:40), the lower Merrimack was virtually depopulated during the early seventeenth century. Indians continued to hunt, travel, fish, and trade for furs along the river, but there does not appear to have been substantial Indian settlement in the lower Merrimack (Bailey 1880:65).

Appropriately enough, the Contact period at Shattuck Farm is represented primarily by burials on the Kame terrace. The few sherds of collared and castellated Contact period ceramics found, as well as the glass bead, may have originally been deposited in graves. This area may have been used as a burial ground for some time, or may have been chosen as a place to inter the many dead resulting from the plagues of 1616 and 1633. It is very unlikely that people camped or lived there again after it was known as a burial ground (Morton 1883:170).

We must not underestimate the degree of disruption resulting from these plagues. In particular, I believe that we must interpret the Contact period records for the lower Merrimack not as remnant glimpses of stable pre-Contact life, but as descriptions of a very dynamic and fluid situation in which Indians coped with a world changed dramatically by the loss of thousands of their friends and relatives, and by the arrival and aggressive spread of European settlements. I agree with Thomas that the Indian response to this

situation was more adaptive and flexible than is traditionally assumed (Thomas 1979), and this assumption will underlie the following attempt to reconstruct the last 100 years of Indian history in the lower Merrimack.

The same plagues that devastated the lower Merrimack killed similar numbers of people in the Boston Basin, also, resulting in a power vacuum which probably weakened the ties between the Merrimack River Indians and those to the south. Within the lower Merrimack, land sales were now being made by very marginal people indeed. The area on the north bank of the Merrimack from Haverhill to Methuen was sold in 1642 by the "last of the Pentuckets", Passaquo and Saggahew, with the concurrence of a variety of regional sachems (Perley 1912). In 1644, English settlers from Cambridge settled in Cochichewick, later Andover, and in 1646 the General Court in Boston approved the previous transfer of the land of Andover, as well as south Lawrence and the Shattuck Farm area, from natives to whites. The oral deposition states that the land was conveyed by one "Cutshamache, sagamore of ye Massachusetts," (Perley 1912:39), who reserved the right for " . . . ye Indian called Roger and his company" to take alewives in the Cochichewick River for their own eating, and also that " . . . ye said Roger is still to enjoy four acres of ground where now he plants." (Perley 1912:39). Local traditions and place names locate Roger's lands in present day Lawrence, near the outlet of the Cochichewick River (Petzold 1963), but none of the histories say who Roger was. Cutshamakin, a nephew of Chickatawbut, lived in Dorchester and is dismissed by Bailey as a mere tool of the colonial government, used by the English to acquire land (Bailey 1880). However, he was also a relative of Passaconaway and may have had the right to convey land through this connection, in the absence of anyone with a stronger claim. It is likely that most of the early land sales on the Merrimack required the consent of Passaconaway, who apparently did not contest this particular sale.

Mewnwhile, Passaconaway himself had become the dominant political figure

for the entire Merrimack region. He was already an important personage when he first appears in Winthrop's journals in 1632 (Winthrop 1908:91), but it is evident that he was extending his power throughout the early 1600's. He was an unusual combination of political and religious leader, both sachem and powwow, and undoubtedly a remarkable man (Boulton 1856). It is not clear where he originated; Wood's map shows Mattacomen as sachem at Pennacooke (now Concord, New Hampshire) and "Pissaconawa" at Amoskeag (Wood 1977:16), suggesting that Passaconaway's original base was near Amoskeag. However, by the time he resigned power to his son Wannalancet in 1660, Passaconaway dominated the entire Merrimack River basin and his name is strongly associated with Penacook, as well as with Amoskeag and Pawtucket (Day 1978:149).

During the middle and later decades of the seventeenth century, the falls at Pawtucket were still an important location in Indian life and served as a gathering place for many groups during the spring fish runs (Gookin 1792:46). There is no mention of settlements further downstream. There is some evidence that Indians were now more sedentary than they had been previously, partly because of the low population densities resulting from the plagues and also because land sales to the English limited native access to some areas. In addition, wage labor for Europeans and trade with them were important facts of native economic life now, and in times of considerable intertribal warfare it made sense to stay near the fortified European settlements.

From 1615 through 1670, the Western Abenaki of the upper Merrimack were involved in warfare against the Iroquois, and their homelands came under attack from the west. Some fled north to Canada while others came south to the lower Merrimack, and especially to the Pawtucket area, which was under English protection (Day 1978:150). The Iroquois generally avoided antagonizing the English or those Indians under direct English protection, and this was probably one factor in Passaconaway's unfailing friendship with the English.

Gookin remarks that the English and the Praying Indians were miraculously free from attacks by the "cruel and murtherous Maquas" (Mohawks), although other Indians were being killed as far east as Haverhill (Gookin 1792:23).

Our best description of the Indians in the lower Merrimack during this period is provided by Daniel Gookin, Superintendent of Indians for the Massachusetts Bay Colony. He states that there were 250 men, plus their women and children, living at Pawtucket in the early 1670's (Gookin 1792:9). Most lived by horticulture, although some had been driven to wage labor for the English because of loss of their lands (Gookin 1792:22). Gookin refers to all the people of the Merrimack as the Pawtucketts, and lists the subsachemships as the "Pennakooks, Agawomes, Naamkeeks, Pascatawayes, Accomintas, and others." (Gookin 1792:9). This listing does not make geographical sense, but may well reflect the order of these groups' importance in a demographic or political sense. If so, it is not surprising that by the 1670's the Indians of the Merrimack were being referred to as the Penacook Confederacy (Boulton 1856).

Most Merrimack River Indians either fled to Canada or continued to be friendly with the English, despite considerable provocation, through the troubled 1670's, but there was some raiding in the Andover area and elsewhere along the lower river (Johnson 1940). The Praying Indian village at Wamesit, consisting of 2500 acres of land south of the Merrimack between Pawtucket and Hunts Falls, was established in the early part of this period. Fifteen families lived there in 1674 (Gookin 1792:46) and some were still there in 1684, but the village was abandoned not long after. There continued to be occasional conflict between Indians and whites in the Merrimack valley until the end of the French and Indian war in the mid-eighteenth century.

A small Indian village may have lingered on Pine Island just west of Shattuck Farm. Town histories report that an Indian weaver named Nancy Parker was the last inhabitant of that village, apparently in the very early 1800s

(Fuess 1959:29) "She was remembered by the very old settlers as a tall wild-looking, but harmless and industrious Indian woman, making her rounds among the farmers of the region" (Dorgan 1918:9). Thus, the last evidence of Indian use of the Shattuck Farm area dates to a time when farmers' plows had already begun to destroy the evidence of earlier times.

## Chapter 8      SUMMARY AND RECOMMENDATIONS

In this final chapter I will attempt to assess the overall significance of the Shattuck Farm site, first as a location used continuously by people for a variety of purposes over at least 8000 years, and then as a cultural resource, an "information mine" with potential for increasing our knowledge of the past. I will then make recommendations as to how this potential can best be protected or maximized.

I have argued that prehistoric people were attracted to this location because of several salient attributes. First, Shattuck Farm is located on the Merrimack River, the major transportation and communication route for this region and also the source of abundant resources. Shattuck Farm could also offer access to a relatively extensive marsh and to a small falls. The former greatly increased the diversity of resources available at this location, while the latter provided access to both freshwater and anadromous fish, with the latter available in very large quantities during the spring. Finally, Shattuck Farm offers numerous springs, streams, and other sources of drinking water, as well as a large level area of sandy, excessively drained soil. This soil made the area comfortable for camping, and may also have meant that the area was more open and free of vegetation than were locations with other types of soils. The major disadvantages of the Shattuck Farm location are the lack of shelter from prevailing winds and the lack of access to upland areas via secondary rivers.

An important influence on Shattuck Farm was its close proximity to two locations that are likely to have been even more important to prehistoric people; Pawtucket Falls, 12.7 km upstream, and Bodwell's Falls, 4.1 km downstream. Both falls were higher than those at Shattuck Farm, and both are located at the confluences of major tributaries to the Merrimack, so

that they would have been transportation crossroads. Both of these locations are within a few hours travel of Shattuck Farm, either by canoe or by foot, and it is important to bear in mind that the way people used Shattuck Farm was undoubtedly affected by the ways in which they were using the areas around Pawtucket and Bodwell's Falls.

Environmental conditions at Shattuck Farm were very different in early post-glacial times, and this may explain why collections and excavations have produced no definite evidence for Paleo-Indian or Early Archaic use of the site. Diagnostic Middle Archaic artifacts were not found in our excavations but they are well represented in collections from the site. Evidence suggests that the people of this time period camped mainly on the alluvial terrace at the major bend in the river, and that Shattuck Farm was used as a base camp for people exploiting the many resources of the area, perhaps during several seasons of the year. Late Archaic materials were also concentrated on the alluvial terrace at Loci D and E, although a few projectile points of this period are also found at other locations. Shattuck Farm was apparently still being used as a base camp, perhaps by fairly large groups who stayed there for long periods, including both spring and fall. These people hunted, fished, collected and processed a wide variety of foods, and did heavy woodworking and other manufacturing and maintenance tasks. They buried a few of their dead on the kame terrace behind their camping area.

A shift in the use of Shattuck Farm may have begun in the later part of the Late Archaic, but is quite evident by the Early Woodland. Virtually all Early Woodland ceramic sherds were found on the remnants of the kame terrace, suggesting that the inhabitants of the site now were more interested in terrestrial than riverine resources. The evidence also suggests that these people came to the site mainly in the fall to hunt birds and fur-bearing mammals, and to collect nuts and other plant materials. Early Woodland

users of Shattuck Farm were apparently living there in small family or task-specific groups, and their main base camps were located elsewhere.

Middle Woodland users of the site also appear to have lived in small groups there, but their use of the area was primarily during the spring and they seem to have focussed their activities on the falls and the marsh. The sturgeon fishing camp at Locus G may be typical of Middle Woodland use of Shattuck Farm. Hammerstones are abundant, suggesting bulk processing of either foods or of reeds, grasses, bark, or other plant materials used for baskets and mats. Some food or other material was also processed in the large earth oven found at Locus D. A hearth located on top of a knoll at Locus B may have been part of a sweathouse built during this period. Again, the main villages during the Middle Woodland period appear to have been elsewhere.

The early Late Woodland period is the most difficult to interpret of all the periods at Shattuck Farm because the major occupation area was in the plowed fields, but the scanty evidence available suggests that the area was now used by larger groups or for longer periods. We cannot be sure, but the area may have been used now by groups who congregated for the spring fish runs. Later in the Late Woodland period, Shattuck Farm was again being used by small groups who came primarily in the fall for hunting, fishing, and collecting. Horticulture was now part of the adaptation in this area, but there is no evidence for prehistoric farming at Shattuck Farm, and it is assumed that the large farming villages were located closer to the coast. During the Contact period, Shattuck Farm was used primarily as a burial ground, although it is possible that people also camped there occasionally as they traveled up or down the river.

The Shattuck Farm location may have been used almost annually during most of the prehistoric period; virtually all projectile point and ceramic types for the region have been found there, and the abundance of artifacts in

inventoried collections is impressive, considering that they represent only a small proportion of all the artifacts collected there over the years. While not necessarily their main camp on the lower Merrimack, Shattuck Farm was clearly an important location for prehistoric people.

Early historic people settled at this location because of some of the same attributes that had attracted prehistoric people; the level sandy soils were now seen as valuable for farming, and the falls in the river may have been a useful fishing and fording place. The Merrimack was quickly supplanted by roads as a transportation route, but passenger-carrying steamboats did ply the river up into the nineteenth century. In the early 1800s, industrialization began at many locations along the Merrimack and Shattuck Farm narrowly avoided becoming a mill town. However, the Essex Company chose Bodwell's Falls instead for its dam, and this fact helped ensure Shattuck Farm's preservation. It was not close enough to either Lawrence or Lowell to be in demand for urban housing, but was in an excellent position to provide vegetables and dairy products to both markets. Shattuck Farm thus continued as a farm until the early 1970s, when a second round of industrialization in the region finally caught up with this site. Once again, attributes such as proximity to urban areas and major transportation routes made this location of particular value to people.

Thus, throughout its history Shattuck Farm has been an important location for people living in the lower Merrimack, although the reasons for its importance have changed. The recent development of the area for "high tech" industry is only the latest in a long series of uses of this location.

Shattuck Farm is also unique as an archaeological site because of an apparent paradox; the area was disturbed enough to become well-known as a site, but not enough to completely destroy it. The very fact that this area was farmed for so long meant that Indian artifacts were continually being turned

up, drawing collectors to the location and ensuring that the site would be known to archaeologists. If the area had reverted to woodland as have many locations along the Merrimack, or had it become part of an urban area as did Lawrence and Lowell, its archaeological resources would probably be known only from a few brief mentions in early histories. This delicate balance between disturbance and preservation is certainly one reason why Shattuck Farm has been the most famous site on the lower Merrimack for so many years.

The level of disturbance at Shattuck Farm has also resulted in the loss of tremendous amounts of information, though. Our work has shown that the Shattuck Farm site can be seen as a series of partially overlapping subareas, or loci, each of which had a slightly different history of use by both prehistoric and historic peoples. Some of these loci, such as the kame terrace, have been almost entirely destroyed by bulldozing and construction, and this has resulted in serious gaps in our knowledge of the site. Much more land, perhaps 90% of the entire site area, has been disturbed by plowing. Since most of the prehistoric remains at this site were relatively shallow, plowing has disrupted whatever stratigraphy may once have existed, and has destroyed most shallow features. Only a few areas of the Shattuck Farm site, usually those close to water, have been basically undisturbed by historic period activities at the site.

Though the majority of loci at Shattuck Farm have been disturbed to some extent, much data of importance to archaeology does remain, in the undisturbed areas and below the plowzone, where many features and some artifacts still rest in their original contexts. In addition, differences in the horizontal distribution of artifacts can still offer information about activities here at different time periods. Studies have shown that artifacts are usually not transported very far from their original locations by plowing (Roper 1976),

and even the limited testing done in Loci D and E showed that materials of some time periods were quite localized horizontally. These observed distributions of materials by time period were used here to reconstruct uses of the areas different parts of Shattuck Farm through time, and more extensive excavation would undoubtedly provide additional evidence of this sort regarding past activities at the site. In other words, although intensive surface collecting has probably removed most of the larger and more spectacular artifacts from Shattuck Farm, data of even greater interest to those interested in the study of prehistoric culture history and culture change can still be found here.

The fact that this location was an important part of the prehistoric settlement pattern for so long, and that it still has considerable archaeological potential, means that it is of considerable significance as a site. The work done here thus far has only sketched the outlines of the site's potential, and set the stage for more intensive future excavations. Thus, the Shattuck Farm site will need protection from further destruction, to the extent possible given the present uses of the land. I will therefore make recommendations in this regard by landowner, in light of present and projected land uses.

Locus A and portions of Loci D and E are located on Andover Conservation Commission land, and thus are not slated for development or construction of any kind. Heavy use of the public access road by motorcycles or dirt bikes will tear into the site and turn up artifacts, but this type of erosion is also ecologically harmful and is presumably being monitored carefully already by the Conservation Commission. The Conservation Commission land will also be the area most prone to vandalism, however, and this problem may be difficult to control. The publicity surrounding an endeavor such as the Shattuck Farm project always carries the danger that unscrupulous relic collectors will be alerted to the fact that there are still archaeological artifacts to be found

here. Most collectors will continue to surface collect in the plowed fields, but a thoughtless few will bring in shovels and begin digging holes in the few undisturbed areas of the site. This is destructive to the environment as well as to archaeological resources, and it is also illegal; no archaeological work of any kind is allowed on any public land without a permit from the State Archaeologist. The Conservation Commission must be aware that vandalism may be a problem here, and might consider checking their land more frequently to see if it is occurring.

Loci B, C and part of D are located on Hewlett-Packard land. The Hewlett-Packard Company has already completed major construction on their property, and have indicated that they do not intend major development of the Spindle's Creek area. Thus, all three of these loci should be adequately protected. The Hewlett-Packard property is also fenced and patrolled, so vandalism should be far less of a problem there. I recommend simply that if any development does take place in the Spindle's Creek area, that the existence of these loci be taken into account and that they be avoided as much as possible. It should be noted that these loci are rather shallow, and that even minor changes such as landscaping, pulling out tree stumps, planting trees or shrubs, or building paths could have an unfortunate impact on the loci.

Most of Locus E and all of Loci G and H, as well as the remaining portions of the loci south of the Valle's filtration bed, are located on Digital Equipment Corporation land, which has yet to be developed. Preliminary discussions indicate that they plan to do most of the major construction near River Road, but that there could be substantial secondary construction of many kinds in the vicinity of the prehistoric loci. Locus E is especially likely to be impacted and, as the core of the traditional Shattuck Farm site, is of special interest to archaeologists. Covering this area with fill before construction would preserve it, and this would be the optimal choice if the

area is to be developed. If this is not possible, additional excavation should be performed. Ideally such excavations should be large scale and extensive, but it is recognized that they would then be both time consuming and expensive. Also, this area has been thoroughly plowed and surface collected over several centuries, and most of the artifacts that existed in what is now the plow zone have been removed (Mahlstedt 1980). Therefore, a useful compromise for this area might be to have bulldozers strip off the plowzone and then to allow archaeologists to map and excavate the numerous features that would undoubtedly be revealed as dark stains against the yellow subsoil. This work could be done very quickly, and would result in the salvage of a great deal of important information about the locus.

Loci G and H are in marshy areas and are probably less endangered as a result. My recommendations for these loci are the same as those for the loci near Spindle's Creek, and for the same reasons. These loci are little disturbed, and therefore of considerable interest. As Digital Equipment Corporation land is presently ungarded, there will be a potential vandalism problem until construction is well underway. Any guards or patrols for the property in general should be told to be on the lookout for unauthorized relic hunters who may be trespassing on the property.

All three landowners should be aware of the fact that Shattuck Farm has produced prehistoric burials in the past, and that others could still be encountered in the course of construction. Excavation of Indian burials presents particularly intricate legal and ethical problems in Massachusetts at this time (Talmadge 1982), and if any such remains are uncovered I strongly recommend that the State Archaeologist be called so that the issue can be settled legally, ethically, and with a minimum of trouble for all concerned.

In summary, Shattuck Farm was not unique as a location of prehistoric activity, but rather was one of a number of large sites located along the banks

of the Merrimack in the vicinity of falls and other major resource areas. However, Shattuck Farm is unique as an archaeological site because it still exists and most of the others have been destroyed or buried under concrete. This report has summarized what we know so far about the site, and has suggested some of the many things we might still learn from it. Again, most of the "conclusions" in this report are more properly hypotheses, and the data to test them may be buried in the ground at Shattuck Farm. We still have the opportunity to preserve a great deal of information about Shattuck Farm's past, without interfering with its future.

Appendix I      SHATTUCK FARM COLLECTIONS SURVEY by Victoria Bunker Kenyon

As part of the Shattuck Farm Archaeological Project, a review of existing artifact collections was undertaken. This was done primarily to expand our knowledge of the site, especially for areas which have been disturbed or destroyed. Collections were examined with full knowledge that the information they contain may be incomplete or otherwise biased. However, it is believed that they can still contribute valuable information to our overall understanding of Shattuck Farm.

The procedure for soliciting information on artifact collections was a simple one, but one for which we owe the deepest gratitude to Eugene Winter. Our starting point for identifying individuals who might have visited or collected at Shattuck Farm was a list of names he compiled. In many conversations, Gene also suggested institutions at which he believed Shattuck Farm artifacts might be located.

The list of collectors consisted of 76 names. An introductory letter explaining the nature of the project and inviting people to share their knowledge was sent out to all 76. A self-addressed, stamped, response card was also enclosed with the letter. A total of 41 cards (54%) were returned; of these, 29 (71%) were returned because of the wrong address, because the individual was no longer at that address, because the individual had died, or because the recipient had no artifacts from Shattuck Farm. Only 7 (17%) of the respondents returned the card with positive responses; another 5 persons (12%) indicated an interest in the project although they said they owned no artifacts from Shattuck Farm. Of the people who did not respond, several are known to have extensive collections from Shattuck Farm. On the other hand, two collectors who were not on the list have independently contacted us to permit examination of their materials.

In addition, a total of four institutions have been identified as having collections from Shattuck Farm. These include the Peabody Museum of Salem, the North Andover Historical Society, Buttonwoods (the Haverhill Historical Society), and the R.S. Peabody Foundation for Archaeology in Andover.

As the collections were seen, a simple recording procedure was used. Artifacts were roughly divided into types based on the typology used for the Massachusetts Historical Commission survey of Massachusetts collections (Anthony, Carty, and Towle 1980). Total numbers of items were tabulated by type and lithic raw material whenever appropriate. Provenience or associational data, or the date of collections, were noted when available. All artifacts (or at least a representative sample) were photographed in black and white. This was done to speed up the recording process and to create a document from which some measurements and other descriptive data might be obtained at a future time.

The information compiled through collections review may contribute useful information even though biases are inherent in this form of data. First, use of artifact types in describing the artifacts may mask some internal variation. However, the photos help preserve much of the raw data, and this seemed the most appropriate method given our time limitations.

The nature of surface collections themselves is also a source of bias. None of the collections were made systematically. Among the collectors there

may have been little agreement on the size, color or shape of the artifacts which attracted their eyes or which they chose to save. DiPesa mentioned that he found pottery only on rainy days; Potvin was especially sensitive to the presence of quartz, as attested by the abundance of quartz items in his collection. However, Gene Winter states that some individuals would often pick up everything they noticed, including debitage, in order to conceal their favorite collecting spots from other collectors by their apparent absence of materials. As a result, we are lucky to have present a wide morphological range represented in some of these collections. It is hoped that the sheer quantity of material collected and the large number of existing collections, when considered as a whole, will compensate for whatever biases may have existed on the individual level.

A description of each collection appears below. First is an introductory paragraph giving some feeling for the collection, its condition, and how it was made or acquired. This is followed by a table giving the artifact types by raw material where appropriate, and by provenience where available. Maps indicating the locations distinguished by certain collectors are included.

#### BERRY COLLECTION

Dr. Clyde Berry of Auburn, New Hampshire, has made an extensive collection from numerous sites in the Merrimack drainage. Among the many sites visited and collected by Berry was Shattuck Farm. The collection was created prior to 1938, at which time he wrote an artifact catalogue illustrated with beautifully drawn and tinted contour maps showing site locations and artifact distributions. Berry has donated his collection, catalogue and drawings to the Manchester Historic Association in Manchester, New Hampshire.

The Shattuck Farm portion of the collection was part of a loan of artifacts to the Archaeological Research Service at the University of New Hampshire, Durham, New Hampshire, from the Manchester Historic Association for study purposes. Permission was requested from both institutions to record the Shattuck materials. Photography was not permitted since the Manchester Historic Commission reserves all photo rights and utilizes their own staff photographer. A complete list of Shattuck artifacts was compiled from Berry's catalogue and the numbers were checked against the actual artifacts. Unfortunately, over 100 items are missing; they were not located among the materials loaned to the University nor were they found in a subsequent search in the Historic Society storage room. It is hoped that the missing artifacts may still be found, and to that end their numbers are listed here (Table 73).

The Berry collection is especially important for several reasons. Foremost is the fact that Berry recorded the location of many of his finds (Figure 35). Additionally, he collected debitage as well as entire artifacts. Finally, much of his collection was made prior to the 1936 flood; while the effects of the flood are poorly known, they may be clarified through the Berry Collection.

In order to derive as much information as possible from the collection, locations of artifacts are recorded. Artifacts which were either available or unavailable for study are listed separately. In the case of the unavailable artifacts, the area of the site in which they were found is noted and they have been classified in a general way according to Berry's original designations.

Table 73. Berry Collection

<u>AREA A</u>	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Otter Creek point	1				
Brewerton point		2			
Normanskill point	1				
Squibnocket triangle		1	1		
Small Stemmed point		3			
Orient point		1			
Meadowood point		1			
Levanna point		1			
Untyped bifaces		4			
Biface fragments		9	1		
Scraper		2	1	1	
Drill	1	2	1		
Core		1		1	
Flakes		7		4	
1 atlatl fragment					
1 celt					
1 gouge					
1 notched pebble					
1 worked slate fragment					
1 unmodified cobble					
3 graphite fragments					

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Table 73. Berry Collection (Continued)

AREA B

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Stark point			1		
Squibnocket triangle		5	6		
Small stemmed point		1	5		
Atlantic point		1			
Susquehanna broad point		1			
Orient point		1			
Levanna point		1	1		
Untyped bifaces		3	4	1	
Biface fragments		11	5	1	
Scraper	1	6	1		
Core		7	1		
Flakes	1	52	3	8	5

1 anvil	5 gouges
1 ulu	1 atlatl weight (in 3 fragments)
1 worked slate fragment	3 ground stone tool fragments
2 hammerstones	1 plummet
1 incised pebble	1 unmodified cobble
1 ground stone rod	1 steatite fragment

AREA C

1 felsite flake
1 ground stone fragment
1 metal pendant
1 bone ornament

Table 73. Berry Collection (Continued)

PROVENIENCE NOT KNOWN

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Neville point			1		
Stark point		1			
Brewerton point		6	1		
Squibnocket triangle		5	3		
Small stemmed point		1			
Meadowood point		2		2	
Untyped biface		2			
Biface fragments		8		1	
Scraper				1	
Core		4			
Flakes		8			

1 ground stone tool

2 worked slate fragments

1 steatite fragment

1 worked graphite

MISSING ARTIFACTS

	A	B	C		A	B	C
points	30			anvil		1	
"scraper"				pestle		2	
(probably flakes)	15	22	1	semilunar			
sinker	2			knife		1	
drill	5	1		other,	8		
hammerstone	1	3		unidentified			
grinding stone		3					
gouge or celt	2	1					

Table 73. Berry Collection (Continued)

MISSING ARTIFACTS - ARTIFACT NUMBERS:

1184	1422	1563	1999	2508	4227	4410
1185	1425	1568	2002	2553	4396	4411
1187	1426	1569	2005	2554	4397	4412
1233	1435	1542	2008	2556	4398	4413
1235	1496	1575	2009	2558	4399	4427
1238	1497	1577	2010	2559	4000	4428
1239	1499	1579	2012	2560	4400	4429
1243	1540	1622	2013	2561	4401	4438
1269	1541	1463	2016	2562	4402	4439
1270	1542	1977	2018	2569	4403	4440
1271	1543	1978	2250	3270	4404	4441
1273	1545	1981	2251	4222	4405	4442
1293	1546	1982	2497	4223	4406	4443
1299	1550	1988	2499	4224	4407	4444
1306	1551	1992	2500	4225	4408	4445
1416	1557	1995	2507	4226	4409	4446

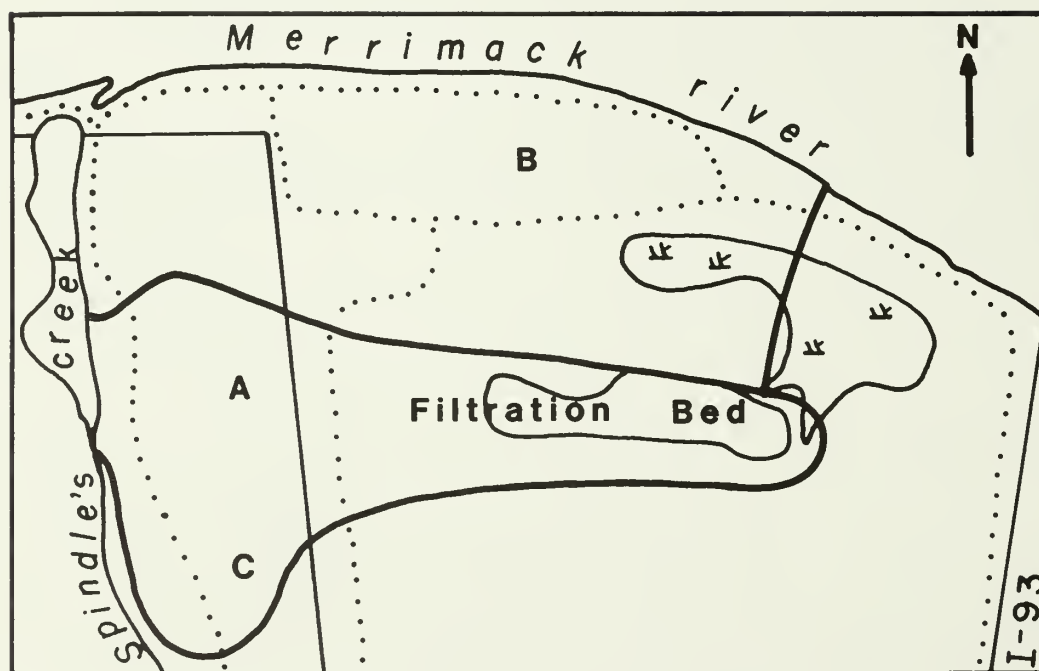


Figure 35. Berry Collecting Areas.

BURTT COLLECTION

Dr. J. Frederic Burtt is Professor Emeritus at the University of Lowell, and an expert on textiles. He is also a past President of the New Hampshire Archaeological Society, and has collections from many sites in the region. He has surface collected at Shattuck Farm for over 15 years, primarily in the plowed fields near the river (Locs D and E). One small box in his collection with about 50 artifacts in it is labeled "One hour's walk at Shattuck Farm". This simply illustrates the great abundance of prehistoric artifacts once available in the fields of Shattuck Farm. Burtt also has the best eye for ceramics of any of the collectors interviewed; over 440 sherds were inventoried from his collection (Table 74).

Table 74. Burtt Collection

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Neville point		8			
Stark point	1	12	1		
Otter Creek point				1	
Vosburg point				2	
Brewerton point	2	12	3	5	
Squibnocket triangle		160	104		
Small stemmed point	2	47	148		
Atlantic point	1	2	1		
Susquehanna broad point		2			
Wayland notched point		1			
Orient point	2	7			
Meadowood point		4		3	
Rossville point		3	2		
Fox Creek point		1			
Madison point	1			1	
Levanna point	2	21	2	1	
Untyped bifaces	7	28	14	1	
Broken bifaces	6	163	42	8	
Reworked bifaces		10	1	2	
Bifacial scrapers		8			
Scrapers	5	28	6		
Drill	12	59	4	2	
Cores	1	38	43	4	
flakes	2	81	30	12	1

Table 74. Burt Collection (Continued)

2 anvils	2 pestles
2 atlatl weights	2 plummets
1 axe	3 ulus
23 gouges	1 worked slate fragment
2 graphite fragments	34 bone fragments
3 gorgets	2 shell fragments
17 hammerstones	charcoal
2 notched pebbles	many sherds

#### BUTTONWOODS COLLECTIONS

At the Buttonwoods, the museum owned by the Haverhill Historic Society, a large collection of area prehistoric artifacts is housed in the Tenney Stables. The collection was created around 1915 by Fred Luce and original members of what later became the Merrimack Chapter of the Massachusetts Archaeological Society. The collection consists of materials from many sites in the Merrimack Valley including the Shattuck Farm site. All artifacts are numbered; the codes are recorded in a series of notebooks in the Haverhill Public Library. Among the notebooks are records of early chapter meetings, descriptions of sites and excavations, excavation guidelines in handbook form, artifact and site numbers as well as beautifully drawn maps by Luce. For many years it has been believed that these notes were burned in a fire; however, the diligent efforts of Gene Winter located the documents in the library.

The Shattuck Farm collection recorded in Luce's notes is divided into three parts; the collection of George S. Gage, the collection of W. W. Taylor and the collection of Fred A. Luce. Unfortunately it was impossible to locate the Gage and Taylor collections at Buttonwoods even though every tray and case was searched. The items collected by Luce himself were found and are described below. Although the Gage and Taylor items could not be identified, important information on their provenience is contained in Luce's notebooks. This information is summarized below.

#### George S. Gage Collection

A total of 180 artifacts were in the Gage collection (artifact numbers 1474-1653). One-hundred fourteen of these (1474-1587) were found in 1914 but have no provenience information. Five artifacts (1588-1592) were found together in a "cache" but its exact location is unknown. The remaining 61 artifacts (1593-1653) have varying amounts of associated provenience data. Of these, 17 were found at the "Indian Burial Place" either on the surface

(four items) at a six inch (15 cm) depth (one item), an eight inch (20 cm) depth (three items, two of which were found together), a 12 inch (30 cm) depth (two items), an 18 inch (46 cm) depth (one item), a 30 inch (76 cm) depth (one item) or in general association (five items). Other items may also have been recovered at the "Burial Place" although this is not clear; among these is one item found at 18 inch (46 cm) depth associated with charcoal, flakes and pottery, and one item at three foot (91 cm) depth associated with charcoal. Two other items have limited provenience information; one item was found "along the river bank" and one item was found on the "surface".

These data, however sketchy, do contain some valuable information. First, we know that Gage was digging as well as surface collecting. Also, artifacts were found in distinct clusters, among them a "cache" of some sort and one or more burials. The "Indian Burial Place" is also of interest. This may correspond to the burials excavated by the R. S. Peabody Foundation (Chapter 3). The nomenclature "Burial Place" suggests multiple burials over a wide, but well-defined area. Furthermore, the features appear to extend from the surface to at least 18 inches (46 cm) and possibly three feet (91 cm) unless the three foot depth corresponds to a separate feature depth. This may suggest that late features were undisturbed by the plowzone. A late temporal assignment may not necessarily hold for all of the burials; Luce has described one spatial association as a "red paint grave", which may indicate an Archaic age.

#### Taylor Collection

The W. W. Taylor Collection consists of one artifact collected in 1914. This is a tooth found in the Phillips Andover excavation. Unfortunately it is unknown whether this tooth was human and what its exact provenience and artifact associations were.

#### Luce Collection

The Fred A. Luce collection was made in 1914, 1915, and 1916 and consists of both surface finds and excavated items (Table 75). Luce recorded provenience for most of the materials. Luce's collection was available for examination at Buttonwoods, and most of the artifacts were photographed. Artifacts and provenience information are presented below. Letters refer to Figure 36.

Although much of the Luce collection has provenience information, its utility is limited because provenience is often stated in relative terms and tied in to landmarks which either no longer exist or no longer have the same name. One frequently mentioned locus is the "burial place", which seems to be at the edge of the kame terrace where the Vallee's filtration bed is now situated. This is suggested by the relation of one find to the river bank. It is also of interest to note that much of Luce's collection was made through actual excavation. The precise location of his "trench" is unknown, but presumably the cultural deposits there extended to a depth of 20 inches (51 cm) below the ground surface. The findings of Small stemmed points in this trench may give some stratigraphic parameters.

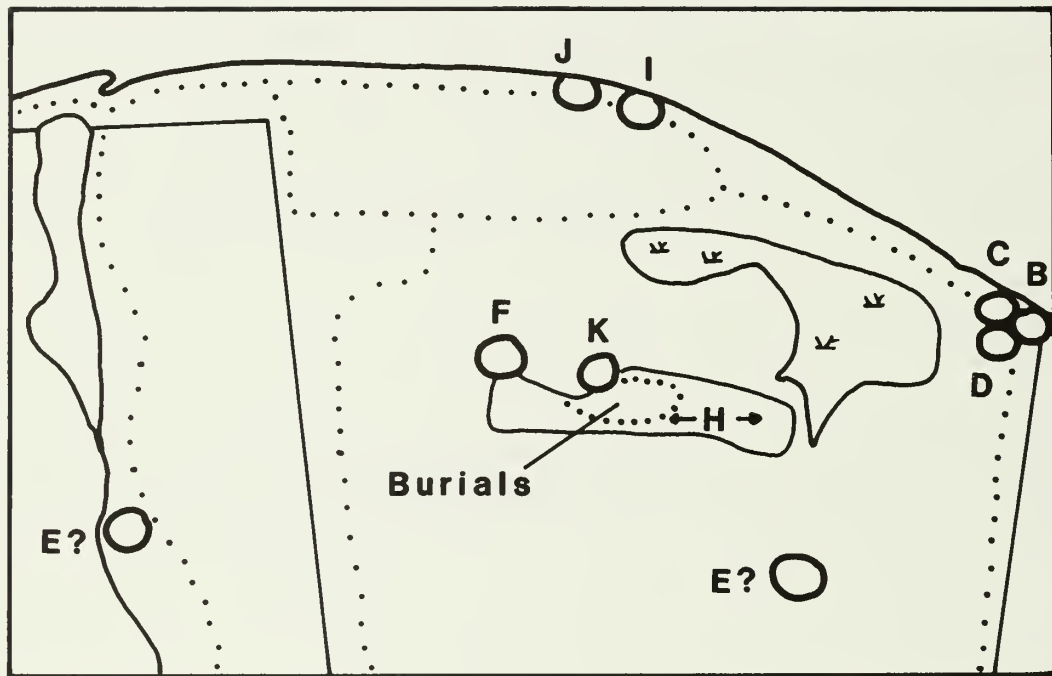


Figure 36. Luce Collecting Areas.

Table 75. Luce Collection

NO PROVENIENCE

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Brewerton eared point		1			
Small stemmed point			1		
Atlantic point		1			
Biface tip		2	2		
Core		2	2		
Flakes		4	2		
1 worked graphite fragment					
4 pottery fragments with cordwrapped stick decoration					

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AREA B - "One fourth-mile (.4 klm) east of Shattuck Farm, 100 feet (30.5 m) from shore, on the surface."

1 unidentified item

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AREA C - "South of Ivy Island, 15 feet (4.6 m) from river."

Small stemmed point	1	1
Core	1	
Flakes	3	

---

AREA D - "South of Ivy Island, 20 feet (6m) from river."

Biface	1
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AREA E - "In a garden near a creek, 1000 feet (305 m) from river."

Small stemmed point	1
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Table 75. Luce Collection (Continued)

AREA F - "Pasture, 400 feet (122 m) from river, 100 feet (30.5 m) north of stone wall, 10 feet (3 m) from skeleton found by Peabody Foundation, 2 feet (60 cm) below surface."

Bone fragments

---

AREA G - "Trench excavated in 1916, 3 feet by 7 feet by 20 feet (.9x2x6.1 m), near old oak tree."

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Small stemmed point		2			
Biface		3		1	
Biface tip		2			
Core		1	2		
Flakes		1			
1 pestle					
1 fragment mica					
8 fragments of fire cracked rock					

---

AREA H - "Surface 500 feet (152 m) from River, 1916."

3 biface tips: 1 of quartz, 1 of chert, and 1 of crystal quartz

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AREA I - "15 feet (4.6 m) from River - same spot as Phillips Andover excavation in 1915."

1 gouge

---

AREA J - "8 feet (2.4 m) from River, 1915."

1 Levanna point of rhyolite

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AREA K - "500 feet (152 m) south of gouge from River - same spot as Phillips Andover excavation in 1915."

1 quartz biface tip

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DIPESA-DUPONT COLLECTION

Ralph (Skip) DiPesa has been collecting at Shattuck Farm for several years. During a visit to the site in the fall of 1980 he happened to meet the survey crew and offered to share his information with the project. In a subsequent visit to his home, it was learned that DiPesa only could make half of his collection available at the time because he had loaned the remainder to his cousin, M. DuPont, also an artifact collector. A brief examination of the Shattuck artifacts on hand revealed a wide variety of lithic artifact types and raw materials, as well as some small fragments of pottery. Lithic raw material sources are a special interest of DiPesa's. DiPesa has also created a series of sketch maps showing artifact locations and dates of finds. These are keyed to artifact numbers. Most of the collection has been made on the lower terrace east of Spindle's Creek (Locs D and E). All are surface finds.

Subsequently I was also able to inventory DuPont's collection, and his artifacts from Shattuck Farm have been added into the total in the table below (Table 76).

Table 76. DiPesa-Dupont Collection

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Otter Creek point	1				
Brewerton point	1				
Normanskill point		1			
Squibnocket triangle		2	2		
Small stemmed point		3	19		
Orient point		2			
Core			2		
Flakes			1	5	

22 untyped bifaces, 1 of quartz; the material not noted for the others

4 gouges

3 hammerstones

1 worked slate fragment

1 worked graphite fragment

1 bone fragment

7 sherds of cordmarked pottery

1 sherd of incised pottery

# GUILMETTE COLLECTION

The Ed Guilmette collection from Shattuck Farm includes a variety of bifaces, stone tools and pottery. Since Mr. Guilmette keeps an extremely busy schedule only a brief viewing of his material was permitted. Only a general description of the variety seen in the collection can be given here; neither photography nor extensive note-taking was feasible during the visit.

Among the artifacts from Shattuck Farm were Stark, Neville, Small stemmed, Squibnocket and other triangular points. Rhyolite, felsite and quartz were the predominant materials. Also included were four gouges and a donut-shaped stone disk with a central perforation. Of further interest was Guilmette's extensive collection from other area sites. Included among the other artifacts was a fluted point of dark green chert, found upstream from Shattuck Farm. This is especially interesting since a single flake of the same green material is included in the Shattuck collection at the R. S. Peabody Foundation in Andover. This thread of evidence may suggest Paleo-Indian occupation at Shattuck Farm, or at least in the general vicinity.

Table 77 lists only those artifacts donated by Mr. Guilmette to the R. S. Peabody Foundation for Archaeology. Exact provenience within the Shattuck Farm site is not known for these artifacts.

Table 77. Guilmette Collection

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Neville point		1			
Atlantic point				1	
Susquehanna point		2			
Untyped bifaces		16	1		
Scraper		1	2	1	
Drill		1			
Core	1	7			
Flakes	1	17	8	4	
1 anvil					
8 modified cobbles					
15 unmodified cobbles					
2 ulus					
1 fragment shell					
1 worked bone					

# HERTRICH COLLETION

The Robert Hertrich collection includes flaked stone tools, debitage, large stone tools, pottery and one bead. Other items include bone and kaolin pipe fragments. The entire collection consists of surface finds; no excavation was undertaken. All of the artifacts were collected within the area bounded by Spindle's Creek on the west and Route 93 on the east (Figure 37). Hertrich never found any artifacts west of the creek, with the exception of quartz flakes found on the knoll just west of the creek (Locus B) and he never collected east of Route 93. He does, however, have artifacts from the opposite side of the river, as well as materials from Fish Brook and Hagget's Pond. Hertrich has identified the area near the northeastern corner of the Hewlett Packard boundary fence (Locus E) as having the highest artifact density; most of his finds were made there. He has also recovered material from the kame terrace just south of the Vallee's filtration bed. Among finds recorded here is the blue glass bead (Table 78).

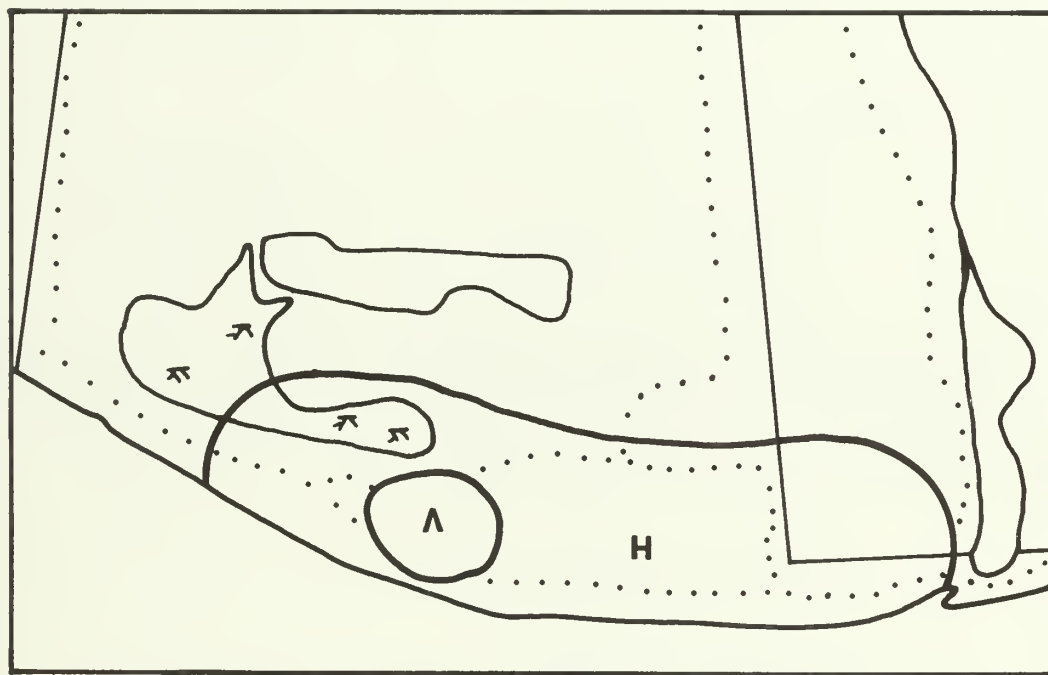


Figure 37. Hertrich, Holmes, and Vossburg Collecting Areas. H = Hertrich and Holmes, V = Vossburg.

Table 78. Hertrich Collection

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Neville point		1			
Otter Creek point	2				
Brewerton point		2			
Squibnocket triangle		2	11		
Small stemmed point		4	7		
Levanna point		4			
Untyped bifaces		12	13	3	

Cores and flakes of felsite and quartz were noted, but counts are not available.

1 chopper

1 gouge

1 notched pebble

3 plummets

1 blue glass bead

incised pottery fragments

#### HOLMES COLLECTION

Paul Holmes has visited the Shattuck Farm site only once. His collection was made on the lower fields (Locus E) and consists entirely of surface finds (Figure 37). He made the collection before Route 93 was built and feels that the main part of the site was located west of the highway and was not extensively disturbed by its construction (Table 79).

Table 79. Holmes Collection

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Small stemmed point		1	1		
Levanna point			1		
pottery - several small undecorated body sherds					

NORTH ANDOVER HISTORIC SOCIETY COLLECTION

The North Andover Historic Society houses several collections from the local area. While most of the artifacts lack provenience, such items as steatite bowls, axes, gouges, adzes, pestles, plummets, beads, bifaces, drills, gorgets, and celts are on display. The collection listed below (Table 80) was donated by Otis Shattuck. It is assumed that the artifacts were collected in the fields at Shattuck Farm, although this cannot be confirmed because a fire in his house destroyed Otis Shattuck's records.

Table 80. North Andover Historic Society Collection

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Kirk point		1			
Bifurcate base point		2			
Neville point	2	9			
Neville variant		13			
Stark point	5	9			
Broken Neville/Stark	3	13			
Merrimack	1	6			
Brewerton point		12			
Squibnocket triangle		14	13		
Small stemmed point		7	19		
Atlantic point	2	8			
Orient point	3	8			
Adena point		3			
Greene point		4			
Fox Creek point		12	1		
Levanna point		16			
Untyped triangles		45	2		
Untyped bifaces		62	2		
Implement blades		38			
Ovate blades		28			
Biface tips	3	37	11		
Medial fragments of bifaces	2	4	1		
Core chopper		7	2		
Drill	1	7		1	
Scraper	1	10	5	3	

Table 80. North Andover Historic Society Collection (Continued)

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Ovate scraper		9			
Core		24	13		
Flakes	16	761	145	1	6
4 atl atl weights		3 notched pebbles			
3 ulus		2 anvil stones			
1 gorget		5 discoidal hammerstones			
2 ground stone rods		9 cobble hammerstones			
3 pestles		3 fragments of worked slate			
3 adzes		7 battered cobbles, quartz and rhyolite			
4 gouges		9 unworked pebbles			
8 celts		8 fragments of worked graphite			

#### R. S. PEABODY FOUNDATION COLLECTIONS

Collections at the R. S. Peabody Foundation for Archaeology in Andover, Massachusetts represent archaeological artifacts collected by archaeologists associated with the Foundation, as well as donated collections (Table 81). Some of the latter are listed separately in this report. Many of the artifacts from Shattuck Farm were surface collected on visits to the site, while others were excavated during the 1914 burial excavations or during Kidder's excavation in 1921 (Chapter 3). Kidder states that his burial was located on a sandy knoll near the river, and this description, plus the notes provided by Luce, suggest that he was working on the kame terrace, probably toward the eastern edge.

Table 81. R. S. Peabody Foundation Collection

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Neville point	1	1	1		
Stark point	1				
Brewerton point	1	4			
Squibnocket triangle		11	3		
Small stemmed point	1	6	9		
Susquehanna point		1			

Table 81. R. S. Peabody Foundation Collection (Continued)

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Meadowood point		1			
Jack's Reef corner notched point				1	
Levanna point		1			
Untyped bifaces		12	1		
Broken bifaces	3	10	1		
Scraper		11		4	
Drill		1			
Core		4	73		
Flakes	4	45	117	1	
<hr/>					
1 celt		9 fragments of shell tempered pottery			
2 gouges		1 antler fragment			
1 gorget		1 long bone fragment			
1 graphite fragment		1 bone harpoon			
17 modified cobbles		1 bone awl			
2 worked slate fragments		2 boxes of bone fragments from burial			
11 unmodified cobbles		with ocher			

# PEABODY MUSEUM OF SALEM COLLECTION

The collection of Shattuck Farm artifacts at the Peabody Museum of Salem was donated by Mr. and Mrs. Harry Waldman. The collection consists entirely of large stone tools; no bifaces or other small artifacts are present. Because of this, it is believed that the Waldmans may have purchased the collection; however, this cannot be confirmed. Precise provenience of the artifacts is also unknown (Table 82).

Table 82. Peabody Museum of Salem Collection

1 quartz core	3 pestle fragments	1 European flint nodule
1 rhyolite core	1 abrader	
2 gouge fragments	4 adzes	1 colonial axe
5 quartz river cobble hammerstones	1 grooved axe fragment	
1 possible anvil stone	1 pecked stone tool	
1 ground stone fragment	1 nutting stone, 5 holes, 45 cm across	

## POTVIN COLLECTION

Ray Potvin's collection is among the largest and most completely documented of the collections seen. It consists of 2151 items, many of which have been recorded and plotted spatially. Potvin has also shared many fond memories of the farm. He began collecting there at age 10, when his family lived quite close to the farm in West Andover. He recalls visits to the farm to see the cows and to eat ice cream at the store. The aura of the farm was one of prosperity and permanence with its finished stone walls, clean buildings, and the best milk in the area.

Potvin also owns an extensive series of photographs taken at Shattuck. Among these are several aerial shots taken before, during, and after construction of Route 93. These are especially informative in illustrating the landscape before it was obliterated by construction. Natural features such as the farm pond and the slope of the second terrace may be clearly seen. His photos also include views of the Hewlett-Packard building while under construction. These are informative in showing the landscape before it was disturbed, as well as the extent of disturbance.

While making his collection, Potvin has divided the site into seven major zones (Figure 38). Most of his finds, including points, pottery and charcoal, were made in zone 2 which he has characterized as the "Number 1 Hot Spot". He has noted the presence of "unusual" finds in zone 1. In zone 3 he has found jasper flakes; another collector is said to have found a thin stone comb-like tool in this zone. Potvin has never found material south of the point where the sewer pipe makes a northern bend near the tip of Spindle's Creek. He does believe that the Valle's filtration bed was the locus of the burial ground and was originally a "sand dune". He suspects that this was the area where Frank B. Sanborn, an early collector who resided in Andover between 1875 and 1895 and is referenced in a Lawrence history, is said to have scooped up Indian artifacts with an oxen sledge.

Potvin was also present when the Vallee's sewer was built. The pipe was laid to a depth of 15 feet (4.6 m); in the trench profiles Potvin noted cultural materials, including a fire pit and stained soil. The feature is located just inside the northeastern corner of the Hewlett-Packard boundary fence. It extended to a depth of 24 inches (61 cm) below the ground surface although the top 14 inches (36 cm) consisted of plowed topsoil. The feature included red stained sand and charcoal. Potvin was not able to recover any further information from this feature since the construction trench walls collapsed and the area was soon filled in. His observations are important in answering some questions on the depth of cultural deposits at the site. The construction trench, dug to 15 feet (4.6 m) permitted a deep, cross-section view of the site; Potvin does not feel that occupation strata extend any further than three feet (91 cm) below the surface.

A total of 91 items in Potvin's collection have general provenience data. Of these a majority (47%) are from Area 2, in the cultivated fields near the river. This section of the site exhibits the highest density of materials with quartz and rhyolite fairly equal in representation. All pottery was found in roughly uniform distribution in Areas 1, 2, and 5 near the river. It would be of interest to know to what extent this is a function of plowing, especially since all sherds are broken into quite small

pieces. Triangular and Small stemmed points are also most heavily distributed in Areas 1, 2, and 5 suggesting that the Late Archaic occupation of the site was also focussed on the zone closest to the river. Artifact density appears to drop sharply as distance away from the river increases. This may, in part be due to recent disturbance although cultural reality may also be reflected given the many years Potvin has been visiting the site. The site also appears to have its western-most boundary at Spindle's Creek. With the exception of a few finds (all of which were quartz) on the western edge of the creek, Potvin has never found any artifacts in the fields below the Hewlett-Packard building. While only 4% of Potvin's artifacts have known provenience, they may be assumed to closely approximate the distribution of other materials in his collection; this has been verified in conversations with Potvin (Table 83).

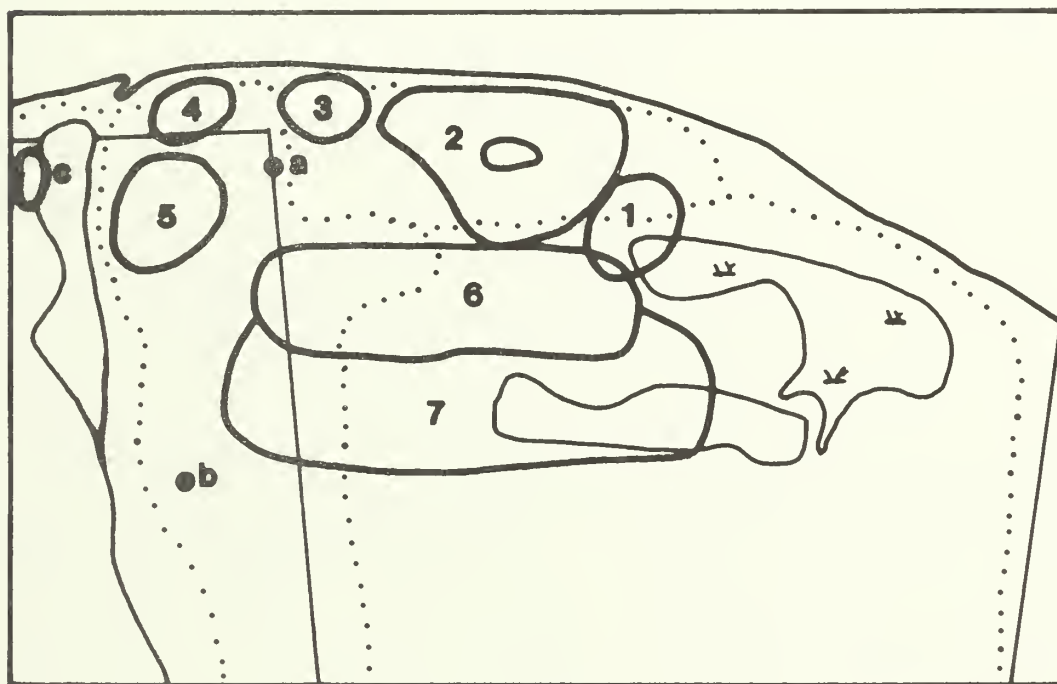


Figure 38. Potvin Collecting Areas. a = fire pit; b = Merrimack point find spot; c = quartz flakes and one small stemmed point.

Table 83. Potvin Collection

<u>AREA 1</u>	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Squibnocket triangles		2			
Small stemmed point		1			
Untyped bifaces		1	1		
Flake			1		
1 hammerstone					
1 gouge					
1 graphite fragment					
2 pottery sherds					
<hr/>					
<u>AREA 2</u>					
Brewerton point		2			
Squibnocket triangle		3	3		
Small stemmed point	1	3	14		
Bifaces		5			
Core		2			1
Flakes		2			
1 gouge					
1 abrader					
6 pottery sherds					
<hr/>					
<u>AREA 3</u>					
Squibnocket triangle		3	1		
Untyped bifaces		2			
Scraper					1
Flake		1			
1 gouge					
<hr/>					
<u>AREA 4</u>					
Squibnocket triangle		1			
<hr/>					

Table 83. Potvin Collection (Continued)

<u>AREA 5</u>	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Squibnocket triangle		1			
Small stemmed point		1			
Untyped biface		3			
Flakes		1	2		
2 pottery sherds					

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AREA 6

Small stemmed point			1		
Scraper		1			
Core		1			
Flake		2	4		
1 hammerstone					
1 gorget					
1 worked slate fragment					
1 fragment firecracked rock					

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AREA 7

Merrimack point		1			
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AREA 8 - (West of Spindles Creek)

Small stemmed point			1		
Biface			1		
Core			1		

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PROVINENCE UNKNOWN

Neville point		1			
Merrimack point		1			
Brewerton point		8			
Squibnocket triangle		23	41		
Small stemmed point		16	32		
Untyped bifaces	2	58	24	5	
Drill		8			

Table 83. Potvin Collection (Continued)

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Spokeshave		1			
Scraper		25	1	2	
Core		21	31	3	3
Flakes		281	904	12	16
8 hammerstones					
1 gouge					
1 abrader					
1 pestle					
1 gorget					
1 steatite fragment					
1 plummet					
1 pecked stone fragment					
3 stone rods					
31 worked slate fragments					
57 fragments of firecracked rock					
2 notched pebbles					
32 unworked pebbles					
16 bone fragments					
2 shell fragments					
364 pottery sherds					

#### VOSSBURG COLLECTION

The Walter Vossburg collection includes artifacts found both on the surface and during excavation. The collection was made 20 years ago during a single visit to the site. All finds are from the alluvial terrace, no more than 100 feet (30 m) from the river's edge (Figure 37).

In his digging, Mr. Vossburg found what he believed was a burial on the lower terrace about 100 feet (30 m) from the river's edge. The feature was encountered approximately 12 inches (30 cm) below ground surface, and extended to a depth of 18 inches (45 cm). The soil in the feature was fine in texture and grey in color, and no fire cracked stone was noted. Closer examination of the bone in the course of the project has revealed that the feature does not represent a human burial but is in fact a refuse pit. Fauna identified include beaver, turtle, fish, and soft shell clam. Included in the feature were two rhyolite bifaces, one rhyolite Samll stemmed point, and a ground slate tool, suggesting a Late Archaic age for the feature. Mr. Vossburg also has several slides of the feature (Table 84).

Table 84. Vossburg Collection

	Argillite	Felsite/ Rhyolite	Quartz	Chert	Other
Small stemmed point		3	2 (broken tips)		
Untyped biface		2			
1 ground slate tool					
2 undecorated body sherds					

Appendix II      REPORT ON GEOMORPHIC INVESTIGATIONS AT THE SHATTUCK FARM SITE  
by Patricia F. McDowell

The Shattuck Farm Site is situated in a relatively unique location, offering a diversity of natural features which may have been advantageous to prehistoric habitation. This report deals with the geomorphic and hydrologic features of the Shattuck Farm site. The regional setting of the site will be discussed, the formation and characteristics of specific natural features at the site will be described, and the soil and sedimentary context of each locus will be discussed.

REGIONAL SETTING OF SHATTUCK FARM

Shattuck Farm is located near the south bank of the Merrimack River, on the inside of a large river bend which swings west, north and east of the site. The majority of prehistoric archaeological sites in the Merrimack River drainage are located close to the river, because the river was important as a source of food resources and for travel (Kenyon and McDowell 1983). Nearness to the river, both in horizontal distance and in vertical elevation above the river level, appears to have been an important factor in habitation site location.

The Shattuck Farm area has several unique qualities when compared to other areas along the river banks in its vicinity. First, there are few other broad, relatively flat areas close to river level within the lower 40 klm of the river above the modern tidal zone. Only one similar area, located in South Lawrence, exists downstream from Lowell. In most of this 40 klm section, the river is flanked by bedrock hills rising steeply from the river banks. Upstream from Lowell, the river flows through a section of wider valley, which contains many locations as broad and flat as Shattuck Farm. In the lower 40 klm above the tidal zone, however, Shattuck Farm is relatively unique in having these topographic characteristics. Second, the Shattuck Farm Site is located next to a former rapids, now submerged by backwater from the dam at Lawrence. Kenyon and McDowell (1983) found prehistoric sites to be heavily concentrated near falls and rapids, perhaps because of the significance of these sites for fishing.

Other natural features at the site, such as the small streams and the swamp, also contributed to the environmental diversity of the Shattuck Farm area, in comparison to other river bank locations in the vicinity.

Bedrock under the Shattuck Farm site is metamorphosed sedimentary rocks of calc-silicate composition (Denny 1982), but bedrock is not exposed at the site and has little influence on surface features. The landforms, soils and surficial deposits at Shattuck Farm are largely the result of Late Pleistocene glaciation. All of New England was glaciated by continental ice sheets from eastern Canada. The last ice sheet reached its maximum southern extent, south of Cape Cod, by 21,000 to 15,000 years B.P. (Mickelson et al 1983). Deglaciation of northeastern Massachusetts is not well dated. Based on radiocarbon dates on glacial deposits in the Boston area (Schafer and Hartshorn 1965) and near Manchester, New Hampshire (Caldwell et al. 1978; Koteff 1980), Shattuck Farm was deglaciated sometime between 14,000 and 13,000 years B.P.

Most of the geomorphic features at Shattuck Farm were created during and shortly after deglaciation. From about 13,000 to perhaps 11,000 or 10,000 years B.P., deglaciation continued upstream in the Merrimack River Valley, where several glacial lakes filled and then drained downstream, and a number of bodies of glacial outwash deposits were laid down. During this period of deglaciation, the Merrimack River at Shattuck Farm was almost certainly affected by major fluctuations of discharge, erosive action, and sediment transport and deposition. By 11,000 or 10,000 years B.P., geomorphic processes were probably more stable, and the major features of the site were in place. During the last 10,000 years, geomorphic change has apparently been limited to erosion and deposition along the margins of the river.

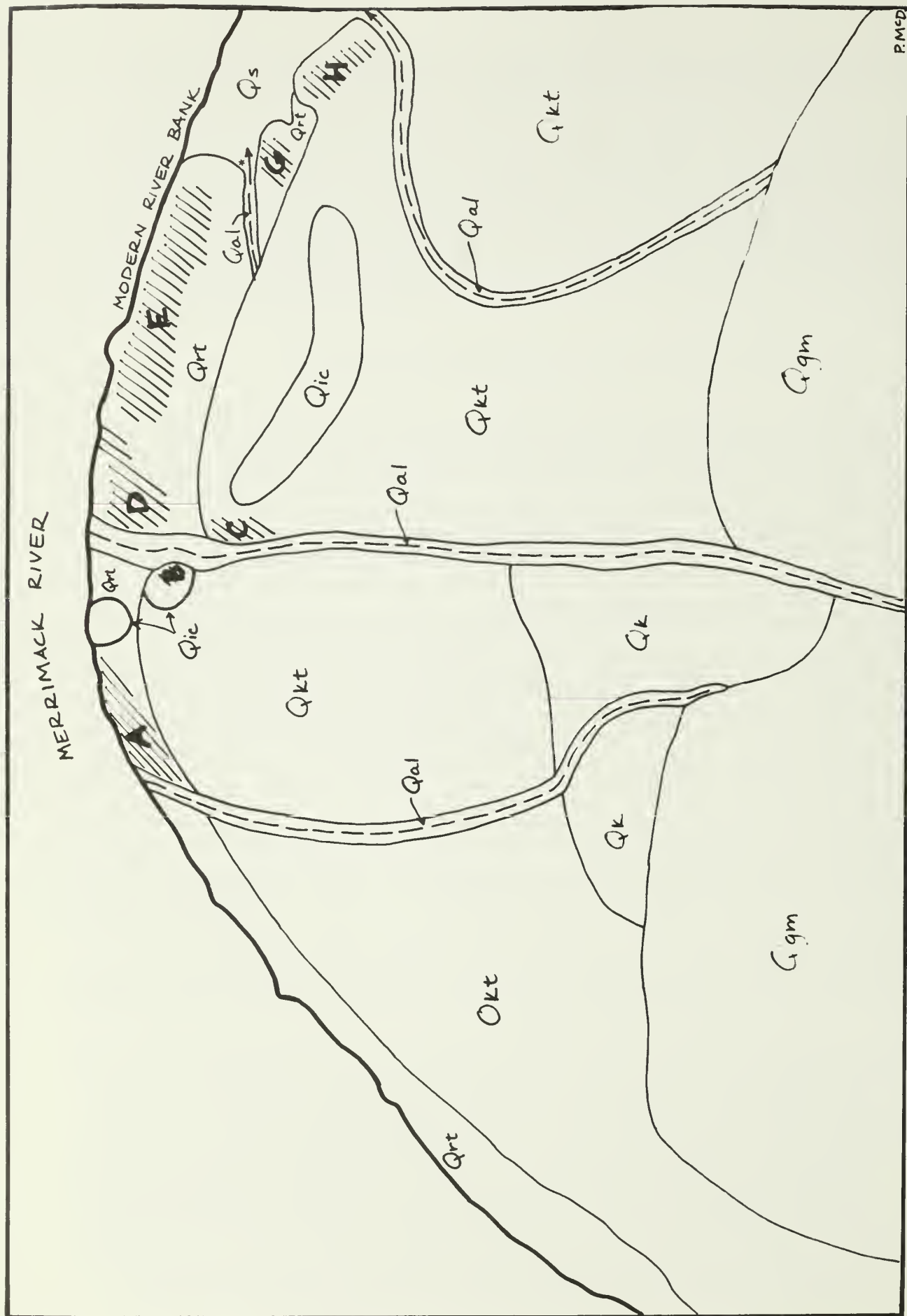
#### PREHISTORIC GEOGRAPHY OF THE SHATTUCK FARM SITE

This section is concerned with geomorphic features located within the Shattuck Farm, their formation and their characteristics. During the historic period, a number of disturbances, including excavation, filling, construction of buildings and roads, and probably damming, have changed or obliterated many of the prehistoric landforms. Figure 39 shows the probable locations of original landforms at the site before historic disturbances. This reconstruction is based on information from Castle (1958), topographic maps, engineering maps prepared for recent development of the site, mapping done during the archaeological investigation, and field observations. The existence of some features shown on Figure 39 cannot be verified, and the locations of some features are known only approximately. Therefore, the figure should not be considered an accurate map drawn to scale. In particular, the modern river bank may not correspond to the prehistoric river bank, due to erosion and/or deposition. (There is no evidence, however, for extensive erosion or deposition at the site.) Additionally, the river level during prehistoric times was probably lower than the modern river level. Today the river is affected by backwater from the dam in Lawrence.

Shattuck Farm is located on a series of gently sloping, smooth to slightly irregular, surfaces which rise in a stair-step fashion southward from the river bank. These surfaces were created by several distinct geomorphic processes, and seven different types of geomorphic deposits are shown on Figure 39. The section (Qrt) immediately south of the river bank, about 40 to 100 m wide, was created by postglacial river deposition. South of this section, the land surface consists of glacial deposits. The glacial deposits here include both till and glaciofluvial deposits. Till is deposited directly from glacial ice, and glaciofluvial deposits consist of glacial debris carried from the melting ice and deposited by meltwater.

Glaciofluvial deposits, the most extensive type at Shattuck Farm, occur in a series of morphosequences within the Merrimack Valley (Koteff and Pessl 1981). Each sequence was deposited downstream from a temporary position of the stagnant, melting edge of the ice sheet, which was the source of sediment. Each sequence may include several types of glaciofluvial deposits. At Shattuck Farm, two sequences occur which were deposited very closely in time (Castle 1958), and the differentiation of these two sequences is not significant for human occupation of the site.

Each type of material will be described below, in chronological order, starting with the oldest. These descriptions are based on Castle (1958),



P.M.D

Figure 39. Prehistoric Geography of the Shattuck Farm Site. Hachured areas and bold letters indicate archaeological loci. Dashed lines indicate small local streams. Star indicates location of marsh core. Qs = Swampy and/or active river margin in prehistoric times; presently swamp deposits and historic river deposits. Qal = Local alluvium of small streams. Qrt = Postglacial river terraces. Qkt = Kame terraces. Qic = Ice-channel filling. Qk = Kame. Qgm = Ground moraine. Not to scale.

Koteff and Volckmann (1973), and field observations. Only five types of deposits, kame terrace, ice-channel filling, river terrace, local alluvial deposits, and swamp deposits, were examined first-hand in the field, and these deposits were seen only in shallow pits and auger holes.

Ground moraine (Qgm): This landform consists of till, a glacial material deposited directly from glacial ice, either through lodgement and compaction at the base of an active ice sheet, or through collapse and slumping of debris off melting glacial ice. The latter type, called ablation till, is probably the dominant type represented at the surface of the ground moraine area. Because till is deposited directly from glacial ice, which carries rock debris from boulders to silt, it is a poorly sorted, unstratified material. Till in this area is dominantly sandy, but includes fragments as large as gravel and boulders and as small as silt (Castle 1958). Till deposits frequently have boulders on the ground surface, but in many areas the boulders were removed during the early historical period for agricultural development. The ground moraine at Shattuck Farm originally had a gently sloping to slightly irregular surface. This material usually forms a somewhat wetter and less well-drained soil than the glaciofluvial deposits. Survey and excavation at Shattuck Farm did not extend into the ground moraine area, and this area has been disturbed by historical agricultural and recent industrial development. Based on its physical characteristics and distance from the river, the ground moraine area offered no advantages for prehistoric habitation compared to the glaciofluvial and fluvial deposits to the north. It may, however, have supported different plants and fauna than the deposits to the north, and it may therefore have contributed to resource diversity at the site.

Kame (Qk): Kames are formed of glaciofluvial deposits laid down in contact with glacial ice, on top of or between large blocks of melting ice. When the ice disappears, the result is an isolated steep-sided knob or group of knobs in a kame field. At Shattuck Farm, the kame is a topographically subdued bench-like feature set against the slope of the ground moraine feature. It may originally have had an irregular surface consisting of mounds of glacial debris. Kame material is generally coarse glaciofluvial sediment dominated by sand with substantial amounts of gravel and boulders. A gravel pit in the kame deposit, shown on topographic maps, suggests that this landform contained coarse sediment and was hummocky or at least steep-sided. In comparison to the ground moraine area, the kame was probably a drier, better drained area and may have supported different vegetation. It is difficult to reconstruct precisely how the topography of these two areas differed.

Kame terrace (Qkt): Kame terraces are formed of glaciofluvial deposits laid down between an ice sheet contained in a valley and the adjoining valley wall. When the ice sheet disappears, the kame terrace is left as a slumped terrace-like feature with a surface which slopes gently down toward the center of the valley. The valley edge of the kame terrace terminates with an ice-contact slope (a steep slope formed by slumping as the ice mass disappears). At Shattuck Farm, the kame terrace is flanked by steeper and higher ground moraine and kame to the south, and on the north by slightly lower river terrace deposits. Compared to the ground moraine and kame deposits, the kame terrace has a smooth and almost flat surface. Castle (1958) mapped two bodies of kame terrace deposits, one slightly younger than the other, in the area shown on Figure 39. The older body occurred in the southern half of the area, and his map suggests that there may have been a distance topographic boundary and difference in elevation between the two bodies. Because of disturbance, this

boundry is no longer evident. There was probably no significant difference between the two bodies in terms of soil or vegetation characteristics, so they are shown as one unit on Figure 39. The kame terrace deposits are probably very similar to the kame deposits in texture, and the main difference between these two units is their surface topography.

Ice-channel fillings (Qic): Ice-channel fillings are glaciofluvial deposits deposited by meltwater streams flowing underneath or on top of the glacier. The stream deposits sediment along its channel. When the glacier disappears, this linear body of sediment is left as a narrow, elongated ridge, commonly forming a steep-sided and prominent topographic feature. Ice-channel fillings include both eskers, formed by streams flowing underneath the glacier, and crevasse-fillings, formed by meltwater deposition in a network of crevasses on the surface of the glacier. Ice-channel fillings are similar to kames and kame terraces in texture, consisting mainly of sand and gravel. Castle (1958) mapped a single body of ice-channel filling, the largest body shown on Figure 39. The two smaller bodies on Figure 39 are prominent knobs of glaciofluvial sediment which are aligned with the large ice-channel filling. These features often occur as a series of aligned but detached knobs. The large ice-channel filling has been almost completely removed during historic times by excavation and by construction of a filtration pond during the recent development of the site. During prehistoric times it was probably a steep prominent ridge visible from the river. It was apparently the site of the highest density of prehistoric artifacts at Shattuck Farm, including burials.

Eolian deposits (not shown on Figure 39): As deglaciation occurred, most of southern New England was covered with a thin discontinuous layer of wind-blown sediment, presumably derived from the surfaces of vegetation-free, aggrading glaciofluvial deposits (Smith and Flint 1935; Colby et al. 1953). This material generally does not form distinct landforms (sand dunes are found in some areas), but simply forms a mantle of silt and fine sand on the surface of the older till and glaciofluvial deposits. Therefore, it is not mapped separately, but it probably occurs at Shattuck Farm, and it probably contributed fine sediment to the younger river terrace, local alluvium, and swamp deposits. At present, the eolian deposits may not be recognizable as a distinct layer on top of glacial deposits because of mixing by frost action, plant and animal activity, and plowing.

River terrace deposits (Qrt): The river terraces occur as one or more smooth, flat surfaces just above river level along the north edge of Shattuck Farm. River terraces consist of river-borne sediment which was deposited in channel bars and on floodplains, primarily during floods. The terraces form when the river incises below the level of the floodplain and bars, ending regular deposition on these surfaces. Because they are deposited from flowing water, river terrace deposits may be very similar to glaciofluvial deposits, but they are usually finer in texture. At Shattuck Farm, the river terrace deposits are stratified silt loam and fine sandy loam, with a few layers of coarser sand and gravel. The terraces here are part of a narrow strip (mostly less than 100 m wide) of terrace deposits running along the south side of the Merrimack River from Pine Island downstream to Lawrence. Castle (1958) suggested that this segment of terraces is "essentially erosional", that is, carved by the river into the edge of the kame terrace, with little or no deposition by the river. This idea is not supported by field evidence at Shattuck Farm, where the river terraces consist of two m or more of sediment which is almost gravel-free and distinctly finer than that observed in glacio-

fluvial deposits. The age of the river terraces at Shattuck Farm is problematical. They may have formed immediately after deglaciation of the site, within a period of one or two thousand years, as deglaciation continued upstream in the Merrimack River watershed. During this period, glacial ice still within the watershed was melting, and several glacial lakes formed in the valley and drained downstream (Koteff 1980). As a result, the Merrimack River carried a heavy load of glacially-derived sediment, and large volumes of water during the summer. This may well have been a period of intense river erosion and deposition, during which most of the river terraces were formed. Alternatively, the river terraces may have been formed by ongoing processes throughout the postglacial period. The former hypothesis seems more likely.

Local alluvium (Qal): This geomorphic unit consists of the alluvial deposits of small local streams, such as Spindle's Creek. Local alluvium occurs in narrow bands, with flat or slightly concave surfaces, along the local streams. Local alluvium is derived from the glaciofluvial deposits with the streams flow across, but is generally finer in texture and includes silt loam. These deposits are poorly drained and form soils which are considerably wetter than the soils of the surrounding glaciofluvial deposits. They may have supported different vegetation than the surrounding areas in prehistoric times.

Swamp deposits (Qs): At Shattuck Farm, the swamp deposits consist of organic matter and silt and fine sand which have accumulated in a depression formed by river erosion. The depression has been closed off on the north, or riverward, side by artificial fill and/or deposition by the Merrimack River. These deposits are historical in age, based on radiocarbon dating and pollen analysis by Kelso (this report). The sand and silt was washed into the depression by local streams and by the Merrimack River during floods. Organic matter accumulated because the wet conditions in the depression prevented decay. This deposit is grouped by Castle (1958) with bodies of peat found in kettle holes and in depressions in ground moraine, but it should be recognized that the swamp deposits at Shattuck Farm are younger than these peats and have a distinctly different origin. The area which is shown in Figure 39 as swamp deposits was probably very different in prehistoric times, when it may have been part of the Merrimack River channel. The history of this area is discussed in the following section under Locus G.

The above discussion indicates that within the relatively small area of Shattuck Farm, several distinctly different natural microenvironments existed in prehistoric times. These microenvironments differed in their topography, elevation, sediment characteristics, and drainage characteristics. I have attempted to reconstruct the major characteristics of each microenvironment, but the reconstructions are incomplete and may include some inaccuracies, due to the major disturbances which have taken place during historical times.

#### GEOMORPHIC CONTEXT OF HABITATION AREAS

Locus A: This area is on a river terrace, which forms a flat surface flanked by a steep river bank on the north and a steep erosional slope leading down to a small creek on the west. On the south edge of the terrace is a small swale running east-west, which is slightly lower and wetter than the main part of the river terrace. Immediately south of the swale, a steep slope (probably an ice-contact slope) leads up to the kame terrace. All pits examined in the terrace area showed at the surface a layer of historic flood deposits, two to

eight cm thick, consisting of pale gray sandy loam. Beneath the flood deposits lie older river deposits with soil development. This soil has a plow zone in its upper 13 to 25 cm. The river alluvium texture ranges from silt loam to loamy fine sand. Four hand auger holes to depths of 1.6 to 2.4 m below the surface revealed the same material exposed in the pits. Some gravels of cobbles were encountered at 1.5 m or below. The gravels may be river gravels, or kame terrace deposits.

Locus B: Locus B occurs on a steep-sided, round-topped knoll rising above Spindle's Creek and above the general level of the kame terrace to the west. The knoll is probably ice-channel filling deposits, a continuation of the larger body of ice-channel filling deposits formerly located on the other side of Spindle's Creek. A second knoll located a short distance to the northwest, at the edge of the river bank, is probably another part of the same ice-channel filling. The ice-channel filling deposits were laid down before the adjacent kame terrace deposits, which were filled in around the knolls by glacial meltwater (Castle 1958). The deposits here consist of stratified glaciofluvial sediment, mainly fine sandy loam with gravel layers. Two pits were examined, with deep augering by hand below the bottom of each pit. Hand augering revealed the same material down to 2.4 m below the surface. The soil at this site is relatively well developed and shows no evidence of plowing. The hearth found at 25 cm below the surface in pit S4 Ell was probably dug below the existing land surface, and later filled in by natural or human processes.

Locus C: Locus C is on the top and west flank of a ridge rising above the east side of Spindle's Creek. The upper part of the ridge has a sloping surface with a few boulders on the surface. (These were the only boulders noted by me on the surface at Shattuck Farm, but boulders may have been more extensive in prehistoric times.) The west side of the ridge slopes down toward the pond formed in Spindle's Creek, and there is a small area of local alluvium at the edge of the pond. (This pond may have been formed by damming in historical times, but the downstream end of the pond was not examined.) The east side of the ridge is formed by a steep slope resulting from gravel quarrying activities which removed the part of this ridge which formerly extended to the east. The ridge at Locus C is the remaining edge of the once extensive ice-channel filling described in the preceding section. Six excavation pits were examined here, and hand auger holes were extended to 1.5 to 2.4 m below the surface in each of them. The deposits at Locus C are stratified fine sandy loam and silt loam, with gravel layers. Most of the gravel is below 1.5 m, but in some pits gravels were found within 15 cm of the surface. The silt loam in the upper part of the deposits may be partly derived from eolian deposits which have been incorporated into the upper part of the coarser glaciofluvial deposits. The soil profiles indicate that the upper part of the area has been plowed, but the steeper slopes to the northwest do not have a plow zone.

Locus D: This area is on a flat, smooth river terrace surface adjacent to the Merrimack River. A steep river bank terminates the terrace on the north, and Spindle's Creek cuts through the terrace on the west edge of the locus. The deposits here are dominated by stratified silt loam, with significant amounts of fine sand and some coarser sand layers. The material is essentially the same down to 3.5 m below the surface, based on a hand auger hole. The deep feature found here, with a date of  $1710 \pm 130$  yr B.P., was dug apparently from the prehistoric ground surface. There is no evidence of significant river deposition during or since the prehistoric occupation. The locus has been plowed in historic times, and there is a thin historic flood deposit on top of the plow layer.

Locus E: Locus E is just east of, and on the same geomorphic surface as, Locus D. Two pits were examined and a deeper hand auger hole was made in one. The deposits consist of stratified fine sandy loam with silt loam and medium sandy loam in some layers. Gravel was encountered at 2.8 m below the surface. Soil development and flood deposition at Locus E was very similar to that at Locus D. At the east end of Locus E the terrace abruptly drops down about one m to a lower terrace surface. Hand auger holes in this lower terrace, at Locus G, and north of the swamp reveal similar river deposits, but differences in soil development. Stratigraphic relationships among these surfaces are shown in Figure 40 and discussed below.

Locus G: Locus G consists of a small area of flat, slightly irregular, low-lying river deposits. A lower swampy area lies immediately to the north, west and east of Locus G, and a kame terrace is on the south. The area is poorly drained, as indicated by poorly developed and mottled soils. In prehistoric time, Locus G was probably a low river terrace with the Merrimack River bank at its north edge, approximately where the swamp is today. The evidence for this conclusion is the historic age of the swamp deposits, and the absence of soil development (and therefore very young age) of the flat area north of the swamp. Topographic and stratigraphic relationships of the flat area, the swamp and Locus G are shown in Figure 40. The prehistoric river bank at the north edge of the locus may have been a steep erosional bank like the one at Locus D and E, or a marshy river bank protected by a river bar from the full force of river currents. In either case, the site was probably subject to frequent flooding and deposition of sediment from the Merrimack River. Although it is on a river terrace, Locus G is clearly lower, wetter, and geomorphically less stable than Loci A, D and E. The area has been drastically changed by historic and modern disturbances, including (1) construction of the filtration bed to the south (on the kame terrace), (2) small pits and mounds dug on the south and west edges of Locus G, possibly during construction of the filtration bed, (3) historic plowing, (4) possibly some artificial fill placed during historic times in the flat area to the north of the present swamp (5) closing of the swamp drainage to east when the interstate highway was constructed, and (6) excavation and probably realignment of the small drainageway flowing north on the east edge of the locus. Four pits and test holes were examined, and deep auger holes were dug at three spots. All subsurface testing revealed stratified fine sandy loam and silt loam, with some layers of medium sand, continuing to 1.6 to 2.2 m below the surface. At two pits (N25 E1 and N17 E25) gravels were encountered at 1.65 m below the surface. At shovel test pit IV T.P. 4, no gravels were encountered down to 2.2 m. The gravels may be river gravels, or they may be part of underlying kame terrace deposits. Soils at Locus G contained several alternating layers of gray sandy flood deposits and dark brown organic matter, indicating repeated flood deposition separated by intervals long enough to allow 20 cm or more of organic matter to accumulate. The soils generally have peaty surface horizons, indicating the site is too wet to allow organic matter decomposition and mixing to form a normal topsoil of mixed humus and mineral material.

Locus H: Locus H occurs on the top and north side of a steep-sided knoll at the northerly edge of the kame terrace. The knoll drops off sharply on the northwest, north and east sides to Locus G and the swamp. In prehistoric times, it was a high and dry knoll which faced north toward over low and wetter swamp or river bank. On its west edge, the knoll has been destroyed by construction of the filtration bed, but the knoll surface probably formerly continued in this

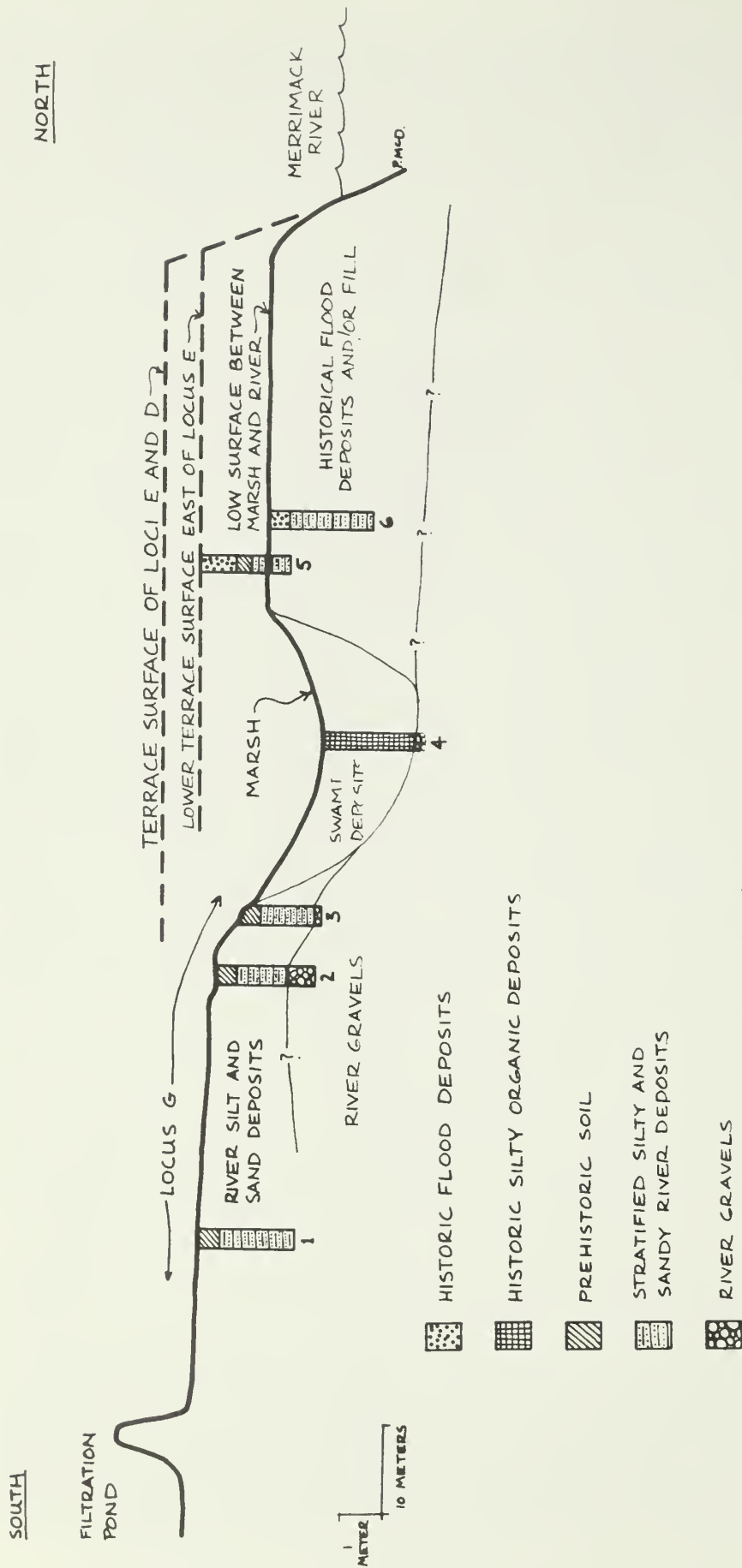


Figure 40. Marsh Cross-section. Shows stratigraphic relationships among Locus G, marsh, river terrace areas to north and west, and Merrimack River. Section is taken south to north, looking west. Elevations of terrace surfaces which occur west of the cross-section lines are shown by dashed lines. Numbers indicate excavation pits and auger holes for which field descriptions were made: 1 = auger hole at IV test pit 4; 2 = N17E25; 3 = N25E2; 4 = pollen core; 5 = auger hole C; 6 = auger hole D.

direction. On the south, the knoll joins the kame terrace. The knoll has several small pits and mounds on its surface from modern or historic disturbance. The original surface of the knoll was probably somewhat irregular and gently sloping. Only one pit was examined here. It showed stratified fine sandy loam down to 1.4 m below the surface, with normal soil development. No gravels were noted.

The discussion above reveals details of the geomorphic and sedimentologic context of artifacts recovered at each locus at the Shattuck Farm Site. Several important contributions were made by the geomorphic investigation. First, careful consideration of the stratification of deposits, presence or absence of soil development, type of soil development, and stratigraphic relationships among deposits and geomorphic surfaces reveals differences in the environments of various archaeological loci. For example, Loci A, D, E and G all occur on postglacial river terrace deposits, but the prehistoric environment of Locus G was quite different from that of the other three loci, and from the environment at Locus G today. Second, the geomorphic investigation has revealed the nature and extent of disturbance after deposition of the artifacts. The site has been affected by historic excavation, fill and plowing, and by historic and prehistoric flood deposition of sediment. Apparently, river erosion has not been significant in postglacial time. The Shattuck Farm Site is in a relatively stable geomorphic environment.

This report on geomorphology is a preliminary attempt to demonstrate the potential contributions of careful geomorphic investigations to archaeological research in New England. The success of this attempt was somewhat limited by the lack of previous research on the postglacial geomorphic history of New England. The inclusion of geomorphic investigations in future archaeological research plans will undoubtedly make each investigation more productive than previous ones.

Appendix III      PALYNOLOGY AND HISTORIC LAND-USE IN CENTRAL NEW ENGLAND:  
THE RECORD FROM SHATTUCK FARM      by Gerald K. Kelso

Shattuck Farm Marsh is a small wetland on the alluvial terrace of the Merrimack River in Andover, Massachusetts (Figure 2). The marsh, once larger but now bisected by I-93, lies 200 meters south of the present edge of the river at the foot of a kame terrace. The segment west of the highway was investigated. Historically this part of the marsh contained a small pond which was replenished by the floods that periodically inundated the alluvial terrace. During the remainder of the year, wet conditions in the marsh were maintained by runoff from the kame terrace. The principal source, prior to the construction of a drainage ditch and pond at the east end of the marsh in the 1970's, was a sinuous swale extending up slope toward the Shattuck Farm buildings (Mahlstedt 1981: 14,39). At present the edges and more shallow portions of the marsh support a dense stand of small trees (Mahlstedt 1981: Figs. 20-21).

Shattuck Farm site loci G and H are located adjacent to and just above this marsh, and the recovery of palaeoethnobotanical data originating with the prehistoric inhabitants of these loci was the original objective of the palynological investigation of the marsh sediments. The radiocarbon dates, as well as the presence of alien weed pollen in the deepest samples, indicate that the marsh sediments in the area where we took our core originated in the historic period. This thwarts our original intentions, but the association of the Shattuck Farm Marsh core with a known farming establishment whose history has been explored (Steinitz 1981) provides the opportunity to examine the potential of palynology for the reconstruction of historic agriculture in New England.

#### LAND-USE AS A PALYNOLOGICAL PHENOMENON

Iverson's (1941,1956) classic model of the distortion of European environmental pollen data by pioneering husbandry (Figure 41) postulates a clearance stage in which all of the primordeal forest pollen types decline while the pollen contributions of the Compositae family, grass family, plantains, bracken ferns, and other opportunistic taxa increase. Cereal pollen makes its initial appearance. In the subsequent farming stage birch, hazel, cultivated cereal, and most weed pollen (bracken fern and Compositae excepted) rise significantly while the major forest trees (primarily elm, linden, ash, and oak) continue to decline. The forest regeneration stage marking abandonment of the agricultural clearing is characterized by the decline of all herbaceous pollen types and an increase in the pollen contribution of the primary trees. Birch declines but the shade tolerant hazel continues to increase. The final, regenerated forest, stage resembles the primordeal forest in its elm pollen component but hazel counts remain higher than formerly while some major, less shade tolerant trees do not fully recover their former prominence.

Initially these "landnam" phenomena were considered to be of very short duration; 50 years overall with a farming stage as short as two years resulting from rapid soil exhaustion (Iverson 1956:37). Radiocarbon dated sequences (Pilcher et al. 1971; Pennington 1975; Edwards 1979) now indicate that this sequence of events can have consumed up to 1000 years, with farming stages lasting 400 years.

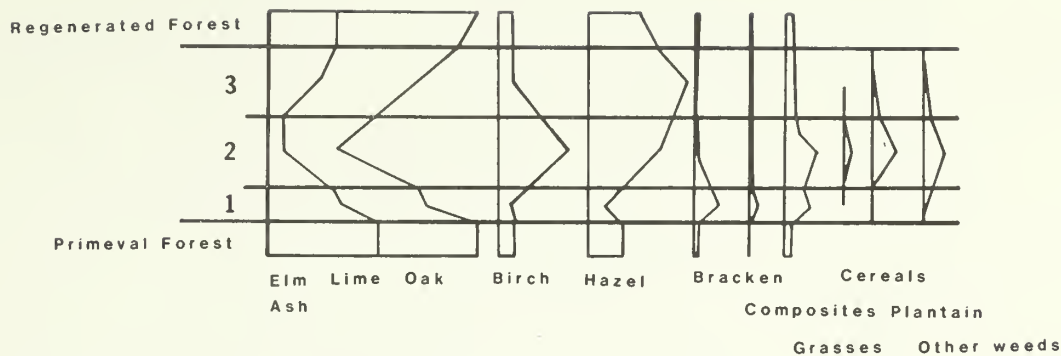


Figure 41. Schematic pollen diagram of a typical Danish clearance and regeneration cycle (after Iverson 1956).

Efforts to refine this model have focused on factoring the human element out of palaeoenvironmental studies. Palynologists directly concerned with cultural questions have, however, addressed the means by which land was cleared (Dimbleby 1978), the spatial distribution of clearance activity (Edwards 1979), and the nature of the human economy responsible (Behre 1983). Particular attention has been paid to distinguishing the proportions of tillage and livestock raising in the husbandry systems of archaeological cultures, but a unified approach to the problem has not been developed. In some studies a simple model in which the ratio of cultivated cereal grass pollen (cereal) to lance-leaved plantain (*Plantago lanceolata*) has been used to index these activities (Lange 1975). However, most investigators have developed more complex indices. That employed by Roberts, Turner, and Ward (1973), for instance, listed *Plantago lanceolata*, *Artemisia*, *Rumex*, and *Ranunculaceae* as pastoral indicators, with cereal, Compositae, Chenopodiaceae, Cruciferae, *Vicia*, *Polygonum*, *Centaurea cyannus*, *Knautia*, *Trifolium*, and *Centaureum* as arable markers. This particular index was applied by expressing the sum of the pastoral taxa as a percentage of the sum of the pastoral and arable taxa.

The pollen contributions of given indicator taxa have varied considerably from study to study. They have also not always appeared on the same side of the arable/pastoral dichotomy, and the lack of consensus concerning the meaning of such indicators has led Behre (1983) to examine the phytosociology of the plants themselves. He found that while a taxa may be most common in one agrarian habitat (winter or summer cereal fields, wet or dry pastures, fallow lands, grazed forest, ruderal spaces), most are present in all disturbed soil situations. Latitude, soil type, depositional matrix, kind of crops grown, and cultivation technology will all alter the ratios of an index, while interpretation is complicated by a lack of data concerning the pollen production and dispersal of most taxa in different contexts (Behre 1983). Such indices have considerable

appeal because the quantification of the data gives them a scientific appearance but for all but the simplest and most stable of husbandry systems, in which the investigator has prior knowledge of the economy and natural environment, they contain a large potential for error. The direct observation of the patterns in the relationships between the individual pollen types through a sequence may produce more reliable results.

## LAND-USE IN NEW ENGLAND

### Arboreal pollen types: documentary record

A significant portion of New England was not densely wooded at the time of the initial European settlements. The open forests have been attributed to Indian agricultural clearances and widespread burning for the benefit of favored non-domesticated resources (Day 1953: 330,339; Carrol 1973:84). This has been historically documented for coastal areas (Russell 1976:11,22,31,523; Day 1953:334-339), but inland openings and more northerly clearings may represent climatic and edaphic climax situations (Raup 1937; Davis 1965:383). The first colonists utilized primarily this available open land (Russell 1976:11,22,31,523) but extensive new clearance began within a decade (Carrol 1973:51). Most early felling appears to have been focused on agricultural clearance (Eastman 1910:273; Carrol 1973:124) and clear-cutting was the rule (Chapman 1939:61). Between 500,000 and 800,000 acres had been stripped by the beginning of the eighteenth century (Carrol 1973:206). Efforts to protect woodlands, especially younger trees, commenced as early as the mid-1600's in some parts of New England but were not effective (Russell 1976:65-66,171-172; Carrol 1973:125-126). Even industrial resources were not conserved (Russell 1976:304). Shipbuilders were importing timber from Maine by the end of the seventeenth century (McManis 1975:119) and the larger population centers were importing firewood by the last quarter of the eighteenth century (Chapman 1939:61). Smaller towns in some areas were reduced to burning peat by 1800, as were some larger towns and cities when wood supplies from Maine were cut off during the War of 1812 (Russell 1976:303-304).

Deforestation was aggravated by a sheep-raising boom in the first half of the nineteenth century, when large sections of Vermont and New Hampshire were cleared for pasture. Even the hills were grassed to their summits. Only the northerly parts of these states and Maine were spared (Russell 1976:353,526-527). The potential for reforestation inherent in the large scale abandonments of marginal farms recorded during the second quarter of that century was not realized as sheepmen took over these properties and completed the clearing (Russell 1976:351-352). Woods survived only in inaccessible places and by the 1860's 85% of Massachusetts, 75% of Connecticut, and 66% of Vermont and New Hampshire were "improved" land. Clearance activities in Maine peaked ca. 1880 at around 26% (Davis 1965:382; Carrol 1973:26; Russell 1976:460,527).

Sheep-raising and, to a certain extent, lumbering declined in New England after 1850, while the abandonment of farms continued as the rural population moved west or into industrial centers. Mountain sides, rough lands, and the poorer areas of still-occupied farms were allowed to revert to woodland (Braun 1950:424; Davis 1965:382; Russell 1976:461,527). Petersham, Massachusetts, for instance, doubled its woodland between 1865 and 1885 and then doubled it again by 1905 when 55% of the town was wooded. Woodland covered half of Connecticut by 1900 (Russell 1976:461). Some of this reforestation was planned (Russell

1976:303,461) but most of it is attributable to natural growth in abandoned fields and untended pastures. Observed pioneer trees include white pine (Pinus strobus), pitch pine (P. rigida), hemlock (Tsuga canadensis), red cedar (Juniperus virginiana), white spruce (Picea glauca), balsam-fir (Abies balsamea), larch (Larix laricina), arbor vitae (Thuja occidentalis), chestnut (Castanea dentata), gray birch (Betula populifolia), paper birch (B. papyrifera), black cherry (Prunus serotina), red maple (Acer rubrum), aspen (Populus spp.) and tree of heaven (Ailanthus altissima) (Raup 1940; Niering and Goodwin 1962; Davis 1965; Raup and Carlson 1941; Goodlet 1934; Westveldt et al. 1956; Spurr 1956; Braun 1950; Bromley 1935; Ogden 1961; Crowder and Cuddy 1973; Barrett 1980; Fowells 1965).

The distribution of these trees varied according to latitude, reproductive adaptations, and the nature of clearance. Shade tolerant hemlocks benefited from canopy removal in partial clearances in Massachusetts (Spurr 1956:247), while pre-blight chestnuts had, as stump sprouters, an advantage in colonial post-logging situations (Braun 1950:251; Davis 1965:382; Anderson 1974:682). Red cedar is favored by sustained grazing and the suppression of fires in pastures (Niering and Goodwin 1962:46). Gray birch frequently accompanies white pine on abandoned farmland but is usually shaded out unless fire intervenes. In this case, sprout birch will dominate (Braun 1950:429). The most prominent "old field" trees, where hardwoods had been grubbed out and could not sprout, have been the white pines that occurred in pure stands on abandoned lands in central New England; the white spruce, balsam-fir and arbor vitae which formed conspicuous coniferous patches on abandoned farms in the deciduous forest sections of northern New England and Nova Scotia; and the red cedar-gray birch pioneers which were gradually succeeded by hardwoods and ultimately by a hemlock-hardwood community across southern New England (Braun 1950:256,429; Davis 1965:382). During the opening years of the twentieth century the "pasture pines" were taken for timber, and clear cutting extensive enough to affect the entire Merrimack drainage was going on in the White Mountains of New Hampshire around 1900 (Russell 1976:528). The cut-off second growth trees were succeeded primarily by deciduous species with scattered conifers, a composition apparently similar to that of the pre-contact forest (Davis 1965:382).

#### Arboreal pollen types: palynological record

Modern and historic observations of land-use and tree distributions may not be directly translatable into pollen distributions. The palynological record of land-use in New England must also be examined. Our most southeasterly pollen spectra are from Barnstable Marsh on Cape Cod (Butler 1959). Here oak (Quercus spp.) and birch pollen percentages increased in the single subsurface historic sample, while that of pine decreased. This suggests the gray birch to oak succession defined by Raup (1940) on granitic upland areas of New England, provided the precedence of the faster growing birches (Fowells 1965:105,582) has been obscured by the 12 to 15 inch sampling interval. It conflicts with Ogden's (1961:423) observed red cedar-pitch pine-oak sequence on nearby Martha's Vineyard as well as historic data for the stripping of Cape Cod oaks for ship timbers (Russell 1976:303-304). Long distance wind-transport of oak pollen is documented (Raynor, Ogden, and Hayes 1974), and this appears to be a case of the regional pollen rain becoming more apparent as the local tree contribution was suppressed (Tauber 1965:30-31), rather than a real increase in local oak pollen sources. The subsequent recovery of the pine pollen count in the surface sample at the expense of oak and birch can be attributed to the

natural seeding of pitch pines on abandoned farms and ship building timber cuts, as well as formal plantations of pines for forest conservation (Russell 1976: 303-304). To the east at Rogers Lake, Connecticut, red maple counts increase as ash (Fraxinus spp.) and oak decline in the uppermost sediments (Davis 1969: 420, Fig. 7).

At Linsley Pond, near Branford, Connecticut, a decline in the beech (Fagus grandifolia) frequencies marks the founding of nearby towns ca. 1640. Initial settlement ca. .75 km from the pond in 1700 resulted in the depression of only the hemlock (Tsuga canadensis) counts, even though firm evidence for soil disturbance was present in the form of increases in the mineral content of the sediments and massive increases in the pollen contributions of native and exotic weeds (Brugam 1976: 352, Fig. 3 and 4). The oak pollen frequencies did not decline until the immediate vicinity of the pond was occupied in the 1790's, providing an excellent example of the masking effect of local tree populations on pollen spectra (Edwards 1979: 264). The rose family (Rosaceae) pollen contribution, although small, became consistent after 1700. Brugam (1976: 357) raised the possibility that this might reflect cultivated fruit trees, but the extremely late, possibly post-agriculture, rise in this pollen type suggests that his alternative explanation, that the pollen is from weedy species, is correct. Blackberries and raspberries (Rubus spp.) will take over a forest stand where more than 50% of the basal area has been cut off (Barrett 1980: 44).

Secondary tree succession may be seen in a small, ca. 1800, increase in chestnut counts and a marked, ca. 1850, increase in birch. The twentieth century chestnut blight (Anderson 1974) is definitely indicated in the post-1900 sediments, as are the recent re-growth of pine and oak. Small, roughly contemporaneous increases in the hornbeam/blue beech (Ostrya/Carpinus) and ash frequencies imply modest expansions in the populations of the parent trees (Brugam 1976: Fig. 3).

In a series of Colonial Period samples collected from an embayment in Boston Harbor (Kelso and Schoss 1983: Fig. 19) all major arboreal pollen types (pine, spruce, hemlock, cedar/arbor vitae, oak, maple, hickory) except birch were found to decline from the mid-seventeenth century to the end of the series in the late eighteenth century. Oak is least affected, while spruce disappears from the record by the early 1700's. These are water-transported pollen spectra. They are probably non-urban and reflect the regional pollen rain. Oral histories collected near another historic archaeological site, the New England Glassworks in Temple, New Hampshire, record reforestation of the ca. 1760 to 1790 site by pine, birch, and red maple after final abandonment ca. 1790 (F. Gorman, personal communication). In the pollen sequence, which admittedly did not extend past the late occupation, only the birch count rises and maple was not seen (Kelso and Gorman, unpublished data).

Further north at Brownington Pond in upper Vermont spruce, poplar (Populus spp.), arbor vitae, and red maple are the primary second growth pollen types (Davis 1965: 395-396). A slight increase in alder (Alnus spp.) pollen is also evident in the Brownington Pond diagram (Davis 1965: Fig. 3). Red maple peaks before the other types and then declines somewhat, possibly reflecting its initial advantage as a sprouter (Fowells 1965: 59). Spruce and fir increase in historic bog sediments on the coast of Maine (Potzger and Freisner 1948), while in a series of small inland Maine lakes a rise in Cupressaceae (arbor vitae/juniper)

correlates with the decline of pine and oak at the inception of historic logging. White pine subsequently recovers at the expense of the Cupressaceae (Davis 1967: 157-158). At Moulton Pond, Maine, hemlock and mesic hardwoods such as beech, ash, and hornbeam/blue beech were the primary victims of European influence indicated in the pollen spectra, while the spruce and alder pollen contributions increased (Davis et al. 1975).

In the only reported pollen record of prehistoric agriculture, McAndrew's (1976) study of southern Ontario, declines in beech and maple are attributed to aboriginal clearance ca. A.D. 1300. These are succeeded first by the relatively fast growing red oaks and then by pines to form a mixed deciduous-conifer forest. Historic agricultural clearance around Crawford Lake, McAndrews' primary site, began in the mid-1840's but the arboreal spectra are little affected and pine does not decline in the counts until a local sawmill was erected in the 1870's (McAndrews 1976:1, Fig. 5). Relative increases in the birch, elm (*Ulmus*), and arbor vitae frequencies parallel the decrease in those of pine. Weed pollen begins to rise before pine declines and the lack of arboreal pollen evidence for the 1846-1851 settlement around the lake documented in colonial land patent records (McAndrews 1975:1) may provide an example of the masking of local losses by the regional pollen rain in relative frequencies. Our most northeasterly example of historic pollen spectra comes from Nova Scotia. Here an increase in the spruce pollen contribution is the primary arboreal indicator of the historic period (Livingstone and Livingstone 1958:356), but the diagram from this area also contains a suggestion of an increase in the alder pollen count. The diagram scale is, however, too small to determine alder's exact relationship to the other anthropogenic types, and the authors do not comment on it.

Palynological studies of historic era sediments in New England and adjacent areas have been focused on the reconstruction of the pre-contact forest composition as an aid in calibrating the analogues employed in the explanation of Quaternary pollen spectra. Regional vegetation patterns and their corollary climatic parameters have been the objectives of these investigations and only superficial attention has been paid to correlating changes in the pollen spectra with historic cultural processes. Secondary reforestation after release from cultural pressure is primarily recorded, and the pollen record of pioneer trees in New England is generally found to agree with the documentary sources. Spruce, fir, and arbor vitae (more properly Cupressaceae) dominate in the north while deciduous pollen taxa are more significant in the south. Pine is not as important as might be predicted from the historic data. Where prominent, it appears as a second stage in succession, after birch or Cupressaceae. Late historic increases and decreases in the pine pollen contribution may have been missed in the coarse sampling intervals employed in most studies. Alder appears in the pollen spectra with sufficient frequency to include it in the opportunistic category. It was probably ignored by historic and modern observers because it is not a forest tree as such in New England. It would fill the pioneer role here, as observed elsewhere, only in relatively moist locations and should not persist as climax forest regenerated (Mathewes 1973:2102).

Oak was not as severely affected in the pollen spectra of some locations as might be expected. The pollen production of unaffected local trees is apparently adequate to cover probable regional losses from cutting at a distance from the sampling site (Burgam 1979:352), while the regional pollen rain may serve to mask local depletion of oaks if the local populations of other trees

are declining as well (Butler 1959). McAndrews (1976) provides evidence that oak, particularly red oak, may actually assume the pioneer tree role and may precede pine in reforestation.

The main difficulty with attempting to apply existing New England pollen data to the study of historic era land-use is the poor resolution of the records of the historic period. Local cultural developments were relatively rapid when compared to normal regional environmental trends. Also, the wide sampling interval employed in most studies, compounded by mixing by benthic organisms (Davis 1967), long distance wind transport, and local over-representation, has served to reduce the impact of specific events on the pollen spectra and to eliminate most of the dating aids that would have been provided by the predictable (Braun 1950:256; Ogden 1961:423) successive dominance of reforestation sequences by different tree pollen taxa. These same factors, plus the agricultural nature of the most widespread clearances, have largely obscured the evidence for selective cutting suggested by documented colonial wood-craft technology as well as pollen sequences, stumps, and surveyors' "witness trees" in other, less completely cleared, regions (Goodlet 1954:9; Carrol 1973:85; McAndrews 1974:1; Morison and Morison 1976:47-48; Russell 1976:59,175).

#### Non-arboreal pollen types

Non-arboreal anthropogenic indicators have received much less attention in New England pollen studies than have the arboreal pollen types. They have largely served as dating aids for specialized studies or as horizon markers for the point at which there is no doubt that man as well as climate must be seriously considered in interpreting pollen spectra. Some authors have excluded the non-arboreal pollen types from their counts, while others have presented the data for only a few major taxa. The pollen of some introduced European weeds is morphologically distinguishable from that of native members of the same taxa but frequently this has not been done. For the most part the nature of the cultural activities reflected, predictably different in many cases from those controlling the arboreal pollen counts, have been defined in only the most general way.

Livingstone and Livingstone (1958:356) marked grass (Gramineae) as the primary anthropogenic herb in Nova Scotia but noted the presence of trace quantities of various undefined kinds of ragweed family (Compositae) pollen and a few grains of dock/sorrel pollen attributable to the European Rumex acetosa and R. acetosella. No cause, other than settlement itself, was assigned to these changes. Slightly more information may be recovered from McAndrews' (1976:Fig. 5) Crawford Lake, Ontario, diagram. Of the weedy taxa diagramed, only grass was present in prehistoric sediments and this pollen type, together with ragweed (Ambrosia-type), sheep sorrel (Rumex acetosella), and pea family (Leguminosae) pollen increased very modestly in sediments dated by varves to the 1846-1851 period of settlement around the lake recorded in colonial land titles (McAndrews 1976:1). The contributions of these types increased markedly in the post-1870 pine lumbering period and corn (Zea mays) pollen appears, indicating agriculture of unknown extent. Plantain (Plantago major and P. lanceolata types lumped) also enters the record at this point. In the early secondary succession stage, while pine frequencies are still declining and hemlock, birch, and elm are rising, the grass, sheep sorrel, and pea family frequencies drop off. Ragweed counts continue to climb precipitously, and those of plantain increase slightly. This does not establish that the grass, sheep

sorrel, and pea family pollen was derived from agriculture, but it does suggest that ragweed and perhaps plantain are more likely to reflect the extent of waste ground than any specific kind of husbandry.

Among Davis's (1967) series of Maine pond and lake diagrams, grass and ragweed (Ambrosia-type Compositae) were the only soil disturbance plants tabulated, but at Moulton Pond, Maine, (Davis et al. 1975:Fig. 5) these are joined by sorrel (undifferentiated) as indicator herbs. A small rise in the pollen contribution of other kinds of undefined Compositae pollen may also be seen in the historic segment of this diagram, and goosefoot (Chenopodiaceae) pollen re-appears after a 3,800 year hiatus in the pre-Contact sediments. To the north and east at Brownington Pond, Vermont, grass, ragweed, and undifferentiated sorrel pollen are again the primary non-arboreal pollen types in historic deposits but aster-type Compositae (Tubiflorae), goosefoot, and wormwood (Artemisia) pollen appear in slightly greater quantities, or are more regularly represented, than in the prehistoric matrix. Three morphological varieties of plantain pollen, lance-leaved plantain-type (Plantago lanceolata), broad-leaved plantain-type (Plantago major), and undifferentiated plantain (Plantago spp.), as well as chicory-type Compositae (Liguliflorae) appear for the first time at this site in the historic era sediments (Davis 1965:Fig.3)

In southern New Hampshire the original clearance and seeding of the New England Glassworks site for pasture in the 1760-1780 period (F. Gorman, personal communication) and the reforestation of the locality after 1790 are clearly evident in the domination of the occupation period spectra by grass pollen and the subsequent decline of this type. Sheep sorrel (Rumex acetosella), ragweed-type, aster-type, wormwood, and goosefoot were the only other herbaceous pollen types represented by more than a single grain and these displayed no trends. One grain of European cereal grass (Cerealia) pollen was noted (Kelso and Gorman, unpublished data). Cerealia pollen was also found in all of the historic period Bostonian Hotel site samples, and the distribution of this type corresponded to the recorded chronological levels of commercial activity, ship loading, which took place in this section of the former Boston waterfront. In these same sediments goosefoot, wormwood, ragweed-type, and aster-type declined with decreased soil disturbance as the commercial focus shifted elsewhere, while the grass and sheep sorrel contributions increased (Kelso and Schoss 1983:72-74, Fig. 20; Bradley 1983:81).

To the south, at Rogers Lake in Connecticut, ragweed and sorrel (undifferentiated) were considered the notable agricultural pollen indicators, while lance-leaved plantain pollen was present but in quantities too small to diagram. A single grain of corn (Zea mays) pollen was tabulated (Davis 1969:420). Grass and aster-type Compositae also rise in the historic sediments, but without comment from the author. At Linsley Pond, Connecticut, Brugam (1976) has much better control over the age of his post-Contact sediments, as well as more intimate knowledge of local settlement patterns, and can be more positive in his interpretations. At this site the most important weed pollen taxa are ragweed, grass, sorrel/dock (Rumex acetosella and R. acetosa lumped), pea family, goosefoot (Chenopodiaceae) and lance-leaved plantain (Plantago lanceolata). The percentages of all these except goosefoot and plantain increase markedly with the increase in the proportion of mineral matter in the sediments. Sedimentation rates indicate that this correlates with establishment of agricultural activity within .75 km of the deposition site. No change in the non-arboreal pollen contribution

had occurred in the 60 years intervening between the initial settlement of the town and occupation of the Linsley homestead. Non-arboreal pollen types are apparently very local indicators of pioneer husbandry, recording only the watershed of the pond. They are, however, rather more sensitive than most arboreal types, as only one of these latter, beech, declined before the shoreline of the pond itself was occupied (Brugam 1976:352,356). Brugam (1976:357) suggests the possibility that a post-1700 increase in the pea family (Leguminosae) pollen counts reflects leguminous pasture plants, and deduces the presence of significant quantities of pasture land near the lake from the Rumex counts on the basis of the presence of Rumex acetosa and Rumex acetosella in infertile modern pastures and vacant lots. Aster-type Compositae was present in significant quantities in pre-settlement sediments at Linsley Pond, and the frequencies of this pollen type do not correspond to occupation of the area (Brugam 1976:Fig.4).

In the Barnstable Marsh, Cape Cod, sediments grass and undifferentiated plantain pollen, prominent elements throughout the core, peak markedly in the assumed active farming spectra of the earlier historic sample, but decline somewhat in the post-farming surface sample (Butler 1959:737, Fig.1). Generalized Compositae pollen rises at the beginning of the historic period but is not recorded in the surface sample while goosefoot pollen rises but does not peak until the other types have declined in the uppermost sample.

The single available study, unfortunately from outside New England, in which measured land use and the pollen rain have been empirically compared is Solomon and Kroener's (1971) analysis of stratigraphic and airborne pollen samples from northeastern New Jersey. In a 60 year reservoir mud sample series, these authors found a steady decrease in the total percent of herb pollen, largely resulting from a declining grass contribution correlated with increasing suburbanization and increasing percentages of tree pollen, mostly oak and birch. Ragweed percentages remained relatively steady, apparently because the disturbed soil habitats of farm land were constantly replaced by those of development sites (Solomon and Kroener 1971:39). When the proportions of contemporary land-use (forest, agricultural land, abandoned farm land, and developed suburbs) in a ca. 24 km surface transect were compared with the relative and absolute quantities of pollen in the air during the growing season, these relationships did not completely hold true and others became evident. Sorrel (undifferentiated) was most prominent in the segments of the transect still being farmed, while aster-type Compositae was clearly associated with abandoned agricultural lands. Wormwood frequencies increase abruptly in the suburbs. Goosefoot, plantain (undifferentiated) grass, and ragweed-type frequencies display no clear trends except that the last declines in suburban situations. Arboreal types generally decline as forested land pinches out in the transect, but oak and willow (Salix spp.) frequencies increase with abandoned lands. Most pollen types, arboreal and non-arboreal, peak briefly in the transect segment where the quantity of abandoned farm land rises abruptly, implying a proliferation of the parent plants in an early succession stage that is subsequently suppressed by an expanding oak population (Solomon and Kroener 1971: Figs. 8,9). Relative and absolute pollen frequencies across the transect generally agree, except that the latter indicate that the oak and total tree pollen contributions, as well as the herb component, decline with suburbanization.

The biota, crop and weed, associated with agricultural activity are legion, but the non-arboreal pollen types identified as anthropogenic indicators in New England historic spectra are relatively limited. These are ragweed-type Compositae (Ambrosia-type), aster-type Compositae (Tubiflorae), chicory-type Compositae (Liguliflorae), sheep sorrel (Rumex acetosella), dock (R. acetosa), goosefoot family-type (Chenopodiaceae), wormwood (Artemisia spp.), broad-leaved plantain-type (Plantago major), lance-leaved plantain-type (Plantago lanceolata) corn (Zea mays), and European cereal grass (Cerealina). With the exception of corn, each of these types incorporates the pollen of a significant number of differently-adapted plants. As a consequence, the same pollen types that indicate agriculture in New England reflect soil disturbance associated with the cutting of mine timbers in Minnesota (Bradbury and Waddington 1973) and over-grazing in eastern Washington (Davis, Kolva, and Mehninger 1977). The botanical literature is no more precise than the palynological record in defining the preferred agricultural habitats of weedy taxa. This is partially because the workers who have dealt with such plants have been interested in eliminating agricultural pests rather than in studying them. The data are also undoubtedly biased by herbicides and the relatively efficient mechanical cultivation of modern agriculture. Our indicator plants are now exiled to fallow ground and ruderal situations, and their pollen in modern studies is distributed accordingly (Vuorela 1973:15).

The majority of New World plants classified as "weeds" originated in Eurasia (Fernald 1970; Muenscher 1955) and it is evident that in the New World, as in the Old, anthropogenic indicator pollen types can originate in almost all culturally related habitats (Behre 1983:Fig. 2). In most cases a given pollen type cannot be expected to unequivocally reflect specific kinds of human activities. Published historic pollen spectra and some data from the botanical literature suggest, however, that certain pollen types should be produced in greater quantities in some kinds of agriculturally controlled habitats than in others. The cereal grains are the best example of this. Corn, the only native North American cultivated grass, is wind-pollinated but its pollen is so poorly dispersed that the hills and swales of cornfields may be detected in prehistoric matrices (Berlin et al. 1977:592). Corn does not grow wild (Galinat 1971:535) and the presence of any pollen of this type is considered to reflect intentional cultivation of the parent plants close to the sampling site (Martin 1963:50). Corn pollen does, however, accumulate on the husks and may subsequently be transferred to the kernels (Bohrer 1972:25). It has been recovered from the fills of numerous archaeological sites in the arid New World and, if preserved, may be found anywhere that corn products were used or discarded.

The pollen of the four primary European cereal grasses, wheat (Triticum), barley (Hordeum), oats (Avena), and rye (Secale) may be distinguished from most of the wild grasses and corn on the basis of size. European investigators routinely differentiate them from each other on the basis of fine surface morphology with phase-contrast microscopy (Behre 1983:227). My experience, and that of Greig (1982:54) has not resulted in really satisfactory resolution among the European cereal types, even when SEM-based keys (Anderson and Bertelesen 1972) are employed. Generic level identifications among the cerealina should, perhaps, be labeled "tentative". Rye is wind-pollinated, or anemophilous. It produces large quantities of pollen and disperses it widely. In Europe it is regarded as one of the most reliable indicators of cultivation

(Behre 1983:227) and should be so in North America as well. Wheat, barley, and oats are autogamous (self-pollinating) and little pollen escapes until the grain is threshed (Vuorela 1973:10). These types are rare, or completely absent in Old World peat profiles, even when cultivation went on quite close by (Behre 1983:227). In modern samples they are more likely to be found dispersed with chaff along transportation routes within farms than in fields (Vuorela 1973:12), but significant quantities have been found in previously cultivated soils where agricultural waste and manure have been applied as fertilizer (the "plaggen" soils of European terminology) and in threshing spoil (Behre 1983:227).

Rumex, undifferentiated but probably R. acetosella, counts were highest among Solomon and Kroener's (1971:Figs. 8,9) data in areas with the largest proportion of actively farmed ground and in Europe it is most commonly associated with winter cereal, primarily rye, cultivation (Behre 1983:Fig.2). Rumex acetosella should also provide a measure of soil quality, as it prefers poor soils to the extent that it is best controlled by fertilization (Muenscher 1955:174; Fernald 1970:571). The other identifiable species of Rumex, R. acetosa, is a plant of meadows, preferably moist meadows, as well as of fallow or ruderal ground. It does not usually occur in actively cultivated spaces (Muenscher 1955:172; Fernald 1970:571; Behre 1983:Fig. 2). Grass, it is intuitively obvious, should be most prominent in pasture or meadow situations, and the Barnstable Marsh and New England Glassworks data confirm this distribution (Butler 1959:Fig.1; Kelso and Gorman, unpublished data). It is not predictable in significant quantities in actively cultivated fields because plowing destroys the perennating organs (Behre 1983:229). Where changes in the quantity of pasture are not involved, increases in the grass pollen contribution may reflect trends toward greater soil stability, at least in the early stages of plant succession (Solomon and Kroener 1971:Figs.8,9; Kelso and Schoss 1983:74).

The Plantago whose rise paralleled that of grass at Branstable Marsh (Butler 1959:Fig.1) was probably P. lanceolata. The parent plants of this pollen type are most frequent in wet meadows or pastures (Muenscher 1955:409; Fernald 1970:1316) and the type is considered diagnostic of such situations in European pollen spectra (Behre 1983:235, Fig.2). Plantago lanceolata is also a significant element in the recolonization of abandoned cultivated ground in Europe. Some kind of plantain assumed this role in historic Ontario (McAndrews 1975:Fig.5). It cannot be disregarded as a possible indicator of fallow ground (Behre 1983:229). Plantago major-type pollen has been categorized as primarily an indicator of footpath and ruderal (waste ground) communities in Europe (Behre 1983:Fig.2) but there, as well as in the New World, the parent plants are not uncommon on rich soils in moist pastures and meadows (Muenscher 1955:409).

Artemisia and the members of the Chenopodiaceae are both most frequent on waste ground in Europe and in North America. These plants, however, prefer rich alkaline soils and the European members of both taxa, which also constitute the majority of such plants in New England, are noted nitrophiles (Behre 1983:236, Fig.2; Muenscher 1955:430-433, 183-189; Fernald 1970:590-605, 1519-1524). Artemisia and Chenopodiaceae populations may expand in nitrogen-rich cattle pastures (Behre 1983:247) but the pollen contributions of these plants may reflect the state of the soil rather than the nature of economic activities.

The wind-pollinated members of the Compositae family are cosmopolitan (Muenscher 1955:422-505; Fernald 1970:1357-1567) and the Ambrosia-type pollen which

originates with them is produced in massive quantities and travels very well (Raynor, Ogden, and Hayes 1974). The type can be expected, as in Solomon and Kroener's (1971) study, to rise for statistical reasons in relative pollen frequencies (percentages) as other herbaceous pollen types decline, because its representation does not depend so completely on local plants. Solomon and Kroener's (1971:Figs.8,9) transect data indicate, however, that Ambrosia-type pollen is predictably more common on abandoned land than near actively cultivated or built-over ground.

The plants producing aster-type Compositae pollen, commonly lumped with Ambrosia-type under Tubliflorae, and the chicory-type Compositae pollen (Liguliflorae) have very similar distributions. Both are more prominent on inactive farmland, pastures, and waste ground than on tilled soil (Muenscher 1955:422-505; Fernald 1970:1357-1567) here and in Europe, but chicory-type is more to be expected in grazed forest (Behre 1983:Fig.2). Both of these taxa are insect-pollinated. They produce less pollen than the plants responsible for Ambrosia-type and disperse it much less widely. Their contribution to pollen spectra is predictably smaller but the distribution of their pollen should more accurately reflect the nature of local land use.

In summary, European-style economic pollen indices cannot be applied to New England historic pollen spectra, even if the problems described by Behre (1983) are resolved. These indices were developed for discrimination among theoretically simple farming vs. stock-raising dichotomies. The Colonial impact on the New World, involving simultaneous exploitation of natural resources for farming of diverse crops, raising numerous kinds of livestock, shipbuilding, smelting, wooden manufacture, and export lumbering was much too complex. The plants producing given anthropogenic indicator pollen types appear to be more common in some culturally related habitats than in others, but the pollen frequencies diagnostic of different habitats have yet to be determined. Single pollen types and single samples will have minimal significance, but in a sediment series spanning a period of economic change, shifts in the relationships of pollen types should reflect alterations in the focus of husbandry. The quantities of given pollen types in individual spectra will not be meaningful but the patterns of their distributions through time, especially if placed in context with other types, should be.

#### THE SHATTUCK FARM POLLEN PROJECT

##### Methods

Pollen preservation in terrestrial sediments of the temperate zone is notoriously poor (King, Kepple, and Duffield 1975) and materials washed into the marsh were considered to be the most probable source of palaeoethnobotanical data at Shattuck Farm. The marsh was therefore cored toward its western end, where topography suggested that the largest proportion of slopewash off the occupied portion of the prehistoric site would accumulate, rather than in the largest and presumably deepest part of the pond where the least biased palaeoenvironmental data should be located (Davis 1973). Figure 39 shows the location of this core.

Coring was done in early November, after local anthesis had ceased, with a three-inch stationary piston corer. It was terminated at -160.5 cm, excluding slump, by an impenetrable deposit of water-worn stone mixed with organic material. The core was split in the laboratory, mapped (Table 85), and sampled for pollen at 5 cm intervals. The pollen samples were oven dried at 100° C for 24 hours before processing to insure constant weights, and five Eucalyptus pollen tablets, each

Table 85. Core Description, Shattuck Farm Marsh, Andover, MA\*

Depth	Description
Surface	Coarse organic debris.
0-14 cm	Fine, dark organic-appearing sediments (5YR2.5/1) with thin silt layers at -9cm (5Y4/1) and -3cm (5Y5/1).
14-20 cm	Dark gray silt with sandy zones (5Y4/1).
20-22 cm	Sand with organic fragments (5Y3/1).
22-32.5 cm	Dark gray silt (5Y4/1) with faint orange spots.
32.5-37 cm	Dark gray silt (5Y4/1) with faint orange spots and two (2.5mm) bands of organic sediment (5Y5/1) alternating with two (2.5mm) sand lenses (5Y3/1).
37-50.5 cm	Dark gray silt (5Y4/1).
50.5-60 cm	Black silt (5Y2.5/2) with organic fragments. Numerous horizontally oriented coarse organic fragments and twigs below -56cm.
60-66 cm	Organic sediment (5Y2.5/2) with two (.75cm) lenses of sandy silt (5Y3/2).
66-71 cm	Fine gray silt (5Y5/1).
71-76 cm	Sandy, dark gray silt (5Y4/1) with scattered thin (.5mm) light and dark bands.
76-82 cm	Sandy grayish-brown silt (5Y5/2) with one faint orange spot.
82-88 cm	Fine, olive-gray silt (5Y4/2), possibly with some clay.
88-89 cm	Organic band (5YR2.5/1).
89-97 cm	Dark gray silt (5Y4/1) with dark streaks (.5mm).
97-102 cm	Organic sediments (5Y3/1) with numerous small plant fragments.
102-150.5 cm	Dark-gray silt (5Y4/1) flecked with organic fragments. Faint orange spot at -110 and two (.5mm) organic streaks (5YR2.5/1) at -131 and -132cm. Chunks of bark between -139 and -150cm.
150.5-151 cm	Organic band (5Y5/1) with leaves.
151-157 cm	Sandy silt (5Y2.5/1) with water-worn gravel (2-3cm) and leaves.
157-161.5 cm	Coarse organic material (5Y3/1) with leaves and water-worn gravel (2-3cm).

\* Based on unquantified observations during pollen sampling.

containing  $19,900 \pm 900$  grains (Stockmarr 1971) were added to each sample as tracers. Extraction followed Mehringer (1967) and residues were mounted in glycerol for viewing. A minimum of 400 pollen grains per sample were tabulated at 430X, and are presented as raw counts in Tables 86 and 87, and as relative frequencies in Figures 42 and 43. Problematical pollen grains were examined under oil immersion at 1000X, and all probable cereal pollen grains were examined with phase contrast at 1000X. Terminology follows Solomon and Kroener (1971). The pines have been divided into Haploxylon-type (white pine in New England) and Diploxylon-type (all other New England pines) and the ratio of Diploxylon-type to identifiable pine is presented in Figure 42. Pollen concentration per gram of sample was calculated (Table 86) following Benninghoff's method, but was not converted into influx figures for individual pollen types. When applied to the counts, changes in pollen concentration were not related to shifts in the preponderance of the major pollen types and are probably due to variation in the sedimentation rate rather than alterations in pollen influx.

#### Pollen sources

The Shattuck Farm Marsh sediments are mainly silt (Table 85) with textural bands in some layers implying episodic deposition. Local topography and reported observations (Mahlstedt 1981:14-39) suggest that these deposits are a mixture of river transported materials and local sediments eroded off of the kame terrace. Much of the material supplied by the latter source was derived from portions of the kame terrace drained by the large swale extending from the marsh to the vicinity of the Shattuck Farm buildings. Sections of high organic content, including plant macrofossils, are evident in the profile and should indicate intervals of low water conditions with vegetation growing on the surface of the marsh, or periods of significant sheetwash from vegetated areas immediately around the marsh. The pollen associated with each sediment source reflects a different scope of human activities and should be identifiable.

A marsh flora generally reflects edaphic and hydrological factors rather than general climatic conditions (Rybníček 1973) and the pollen taxa growing directly in the marsh should be recognizable on the basis of the mesic adaptation of the parent plants, probability of transport, and correlation with changes in sediment type. Differentiating between the pollen contributions of the river and the kame terrace, however, injects an unpleasant element of uncertainty into the interpretation of the Shattuck Farm pollen data.

The river should theoretically provide a regional sample encompassing the entire Merrimack drainage, probably biased slightly toward the deciduous arboreal taxa usually in anthesis during the period of spring floods (Crowder and Cuddy 1973). The kame terrace should present local data, biased toward herbs and a record of husbandry. Unfortunately, sheet wash is primary in concentrating pollen in rivers (Peck 1973) as well as important in some marshes (Cushing 1964). Significant quantities of non-arboreal pollen reflecting activities similar to, but not synchronous with, those predictable on the kame terrace undoubtedly came down the Merrimack. Arboreal pollen of the same taxa contributed by the river, but varying in proportions because of differences in the timing of settlement growth, was falling on the terrace and being washed down slope into the marsh. This problem of source cannot be precisely resolved, and interpretation must proceed on the basis of the probable origins of given counts suggested by the available empirical data and theoretical formulations concerned with pollen transport.

Table 86. Raw Sums: Arboreal Pollen and Total Pollen Concentrations per Gram

Depth in cm	<u>Pinus</u>	<u>Picea</u>	<u>Abies</u>	<u>Tsuga</u>	<u>Larix</u>	CUPRESSACEAE	<u>Quercus</u>	<u>Fagus</u>	<u>Betula</u>	<u>Corylus</u>	<u>Ostrya/Carpinus</u>	<u>Alnus</u>	<u>Juglans</u>	<u>Carya</u>
Surface	25	-	-	1	-	-	26	1	32	2	1	3	-	2
1	23	3	-	3	-	-	29	1	79	10	2	81	-	2
6	40	2	-	2	-	-	23	1	81	4	-	45	-	1
11	39	7	2	5	-	1	36	1	81	7	1	25	-	1
16	61	7	-	17	-	1	33	2	51	10	4	19	1	-
21	68	23	6	18	-	-	31	4	48	2	2	18	1	2
25	60	15	2	19	-	1	36	3	77	3	-	13	-	2
29	49	3	3	17	-	-	35	4	77	2	-	8	-	3
34	52	1	-	7	-	1	40	-	44	5	-	18	2	1
39	74	3	-	14	-	-	27	1	51	8	2	9	-	3
44	75	2	-	6	-	-	32	1	48	12	2	10	1	-
49	57	3	-	8	-	-	13	2	77	13	8	6	1	1
53	47	1	-	5	-	-	31	-	150	3	-	19	-	1
58	28	2	-	4	-	-	39	2	93	1	1	8	1	-
63	23	2	-	6	-	-	16	2	61	4	-	152	1	1
68	33	12	2	3	-	3	14	7	52	8	4	91	-	-
73	29	4	1	5	-	1	17	2	79	5	2	173	-	-
78	60	9	1	13	-	5	42	7	56	3	6	18	1	-
84	84	14	1	26	-	1	29	1	56	2	-	37	1	2
89	90	13	-	24	-	-	24	1	38	13	4	47	1	-
94	91	16	-	13	1	3	31	7	52	8	3	15	-	1
99	36	2	1	2	-	-	32	1	104	2	-	29	-	1
104	108	10	-	23	-	-	28	5	45	4	2	26	2	2
109	63	10	-	16	-	4	36	4	34	11	2	29	4	2
114	71	11	-	14	-	-	39	2	48	5	9	33	-	2
119	52	8	-	17	-	-	53	3	54	2	3	40	2	4
124	177	29	1	45	-	1	60	15	110	30	6	47	5	1
129	109	24	-	23	-	-	26	8	53	3	11	19	2	3
134	93	17	5	14	-	-	32	5	52	7	1	31	2	2
139	83	9	-	25	-	2	50	4	61	4	4	20	2	-
144	94	5	1	18	-	-	32	9	44	19	5	14	-	1
149	63	17	2	20	-	-	47	10	54	2	6	14	1	2
154	68	6	-	-	-	2	39	5	67	15	4	15	-	-
159	56	2	1	6	-	-	22	2	93	5	-	18	2	1

Table 86. (Continued)

Depth in cm	<u>Salix</u>	<u>Ulmus</u>	<u>Populus</u>	<u>Acer rubrum</u>	<u>Acer saccharum</u>	<u>Acer saccharinum</u>	<u>Platanus</u>	<u>Tilia</u>	<u>Cornus stolonifera</u>	<u>Cornus canadensis</u>	<u>Cornus florida</u>	<u>Myrica</u>	<u>Fraxinus</u>	<u>Celtis</u>	<u>Morus</u>	<u>Nyssa</u>	<u>Castanea</u>
Surface	1	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
1	22	2	-	1	4	-	6	1	2	-	-	-	-	-	-	-	1
6	12	3	-	1	-	-	-	1	-	-	-	-	-	-	-	-	4
11	14	4	-	4	-	-	1	-	-	-	-	1	1	-	-	-	4
16	9	7	-	4	1	-	1	2	-	-	-	-	3	-	-	-	2
21	5	17	2	3	1	-	-	5	-	1	-	-	-	1	-	-	4
25	3	10	1	2	5	-	-	1	-	-	-	-	2	3	-	-	6
29	5	10	-	3	3	2	3	-	-	1	-	-	4	-	-	-	1
34	4	3	-	1	1	-	1	1	-	-	-	-	1	-	-	-	2
39	4	8	2	3	1	-	-	2	-	-	1	-	1	-	-	-	2
44	4	8	-	6	2	-	-	1	-	-	-	-	2	1	-	-	-
49	4	4	-	1	9	-	-	-	-	1	-	2	-	-	-	1	1
53	3	6	-	1	-	-	-	-	-	-	-	-	1	1	-	-	1
58	-	7	-	6	-	-	-	-	-	-	-	-	3	-	-	-	-
63	14	1	-	1	1	-	1	-	-	-	-	-	1	-	-	-	3
68	9	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1
73	1	1	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-
78	5	5	2	2	3	1	-	1	-	1	-	1	3	-	-	-	5
84	7	7	1	-	3	-	2	1	-	-	-	-	-	-	-	-	1
89	6	1	-	1	-	-	-	-	-	-	-	-	1	2	-	-	4
94	4	5	-	1	6	-	-	-	-	1	-	-	3	-	1	-	2
99	11	7	-	4	-	-	-	1	-	-	-	-	2	1	-	-	1
104	3	2	-	3	2	-	-	2	-	-	-	-	3	-	-	-	1
109	11	6	1	3	1	1	1	-	-	-	-	-	1	-	-	-	1
114	10	4	-	-	6	-	-	1	-	-	-	2	2	-	-	1	2
119	7	2	-	5	1	-	-	5	-	-	-	-	1	-	-	-	4
124	4	8	-	4	3	-	-	4	-	1	-	-	2	-	-	-	4
129	2	8	-	-	2	-	-	2	-	-	-	-	1	-	-	-	3
134	2	2	1	-	2	-	-	-	-	-	-	-	2	1	-	-	-
139	2	2	-	2	3	1	-	1	-	-	-	-	-	-	-	-	1
144	2	5	-	2	1	-	1	3	-	1	-	-	-	-	-	-	1
149	4	4	-	2	6	-	1	-	-	2	-	1	-	1	1	2	3
154	6	5	4	3	3	-	-	-	-	1	-	-	-	-	2	-	1
159	2	8	-	1	-	-	-	2	-	-	-	-	1	-	-	-	3

Table 86. (Continued)

Depth in cm	<u>Rhamnus</u>	HIPPOCASTANACEAE	CLETHRACEAE	AP: raw sum	AP and NAP: raw sum	AP and NAP: pollen concentration per gram	Pinus by sub-genus		
							Haploxyton	Diploxyton	undeterminable
Surface	1	-	2	98	400	39,419	22	1	2
1	-	-	-	272	400	11,810	19	-	4
6	-	-	1	220	400	16,000	30	1	9
11	2	-	1	234	405	6,910	25	5	9
16	-	1	-	236	400	1,979	43	4	14
21	-	-	-	262	410	3,058	47	5	16
25	-	-	-	264	405	3,192	41	2	17
29	1	-	-	233	400	5,368	36	6	7
34	-	-	-	185	400	2,284	34	1	17
39	-	-	-	216	400	3,753	57	2	15
44	-	-	-	213	400	2,838	46	9	20
49	-	-	-	212	400	5,001	43	4	10
53	-	-	4	270	400	25,018	41	-	6
58	-	-	6	195	410	16,388	22	-	6
63	-	-	-	290	400	23,216	16	2	5
68	1	-	-	240	400	-----	21	2	10
73	-	-	-	322	400	13,001	15	7	7
78	5	-	-	250	405	-----	29	6	25
84	-	-	-	286	400	18,773	54	7	23
89	-	-	1	250	400	4,651	66	11	13
94	1	-	-	264	400	5,128	42	23	26
99	-	-	-	237	410	18,065	30	-	6
104	-	-	-	271	400	7,994	80	2	26
109	-	-	-	241	400	2,911	45	4	14
114	-	-	2	262	400	1,758	59	2	10
119	-	-	-	263	400	-----	30	1	21
124	-	-	-	557	800	5,042	103	23	51
129	1	-	-	289	400	4,625	86	1	22
134	-	-	-	271	405	5,284	59	2	32
139	-	-	-	276	400	3,802	43	14	26
144	-	-	1	258	400	5,339	57	8	29
149	-	-	-	265	405	4,972	32	13	18
154	-	-	-	246	400	-----	39	6	23
159	-	-	-	225	410	11,971	43	2	11

Table 87. Raw Sums: Non-Arboreal Pollen and Undetermined

Depth in cm	GRAMINEAE	<u>Zea mays</u>	Cerealia, total	<u>cf. Secale</u>	<u>cf. Avena</u>	<u>cf. Avena fatua</u>	<u>cf. Hordeum</u>	Cerealia, undetermined	<u>Ambrosia-type</u>	<u>Aster-type</u>	Liguliflorae	<u>Artemisia</u>	CHENOPODIACEAE-type	<u>Rumex acetosella-type</u>	<u>Rumex mexicanus-type</u>	other POLYGONACEAE
Surface	20	-	-	-	-	-	-	-	18	-	-	3	2	3	-	-
1	25	-	2	-	2	-	-	-	34	8	-	1	1	9	-	-
6	75	1	4	-	3	-	-	1	37	7	7	1	1	16	-	-
11	63	-	7	-	3	3	-	1	31	7	1	1	4	17	-	-
16	73	1	1	-	1	-	-	-	39	5	1	8	3	19	-	-
21	39	1	1	-	-	1	-	-	55	9	-	6	9	1	-	-
25	33	2	5	-	4	-	-	1	51	3	1	1	7	11	-	-
29	42	-	3	-	2	1	-	-	23	4	-	1	5	6	-	1
34	85	1	5	-	3	1	-	1	53	4	1	3	4	24	-	-
39	55	5	1	-	1	-	-	-	49	6	-	4	10	23	-	1
44	106	1	1	-	-	1	-	-	36	5	1	4	4	8	-	-
49	56	-	9	1	5	1	1	1	46	12	2	-	-	6	-	-
53	38	1	-	-	-	-	-	-	26	3	-	-	11	8	-	-
58	36	-	1	1	-	-	-	-	17	3	1	-	4	4	-	-
63	48	-	4	-	2	1	-	1	23	2	-	-	-	17	-	-
68	65	-	4	-	3	-	-	1	26	4	-	1	3	26	-	-
73	30	-	1	-	1	-	-	-	9	-	1	-	-	13	-	-
78	68	-	3	-	2	-	1	-	43	7	1	1	-	10	-	-
84	45	-	4	-	2	-	2	-	29	1	-	-	-	11	-	-
89	43	1	1	-	-	1	-	-	44	7	-	-	1	17	-	-
94	63	-	1	-	1	-	-	-	20	4	-	2	1	26	-	-
99	51	1	1	-	-	-	-	1	35	6	-	-	4	9	-	-
104	47	-	4	1	2	1	-	-	30	3	-	1	1	26	-	-
109	89	1	3	1	2	-	-	-	28	5	-	1	-	21	-	-
114	53	-	3	-	1	1	-	1	33	9	1	1	-	13	1	-
119	53	-	1	-	-	1	-	-	32	4	-	-	2	16	2	-
124	87	-	1	-	1	-	-	-	51	3	-	1	2	47	-	-
129	35	-	4	1	3	-	-	-	22	4	-	-	1	14	-	2
134	46	-	5	2	1	1	-	1	49	2	-	-	2	16	-	-
139	46	-	2	2	-	-	-	-	30	7	-	-	1	21	-	-
144	52	1	2	1	1	-	-	-	18	5	-	2	1	37	-	-
149	51	-	2	2	-	-	-	-	22	6	1	2	1	30	-	-
154	57	-	-	-	-	-	-	-	31	3	1	-	4	24	3	-
159	54	1	-	-	-	-	-	-	25	6	-	1	2	14	-	-

Table 87. (Continued)

Depth in cm	<u>Plantago major</u> -type	<u>Plantago lanceolata</u> -type	LEGUMINOSAE	CRUCIFERAE	CYPERACEAE	<u>Typha latifolia</u> -type	<u>Equisetum</u>	<u>Lythrum</u>	MALVACEAE	SOLANACEAE	CANNABINACEAE	UMBELLIFERAE	<u>Thalictrum</u>	other RANUNCULACEAE	ROSACEAE	LEMNACEAE	ONAGRACEAE
Surface	-	1	3	-	2	-	-	208	-	2	-	6	-	-	-	-	-
1	-	-	1	-	4	1	-	3	-	1	-	1	3	-	1	-	-
6	-	1	1	-	7	-	-	-	-	-	-	-	5	4	1	-	-
11	-	1	1	1	7	-	-	-	-	-	-	3	-	1	-	2	-
16	-	-	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-
21	-	2	4	2	4	-	-	-	-	-	1	-	-	2	3	-	-
25	3	3	1	1	1	-	-	-	-	-	1	-	2	-	-	-	-
29	1	3	-	-	3	-	1	62	-	-	-	-	-	-	-	-	-
34	-	-	1	1	19	-	-	1	1	-	-	-	-	-	-	-	-
39	-	2	-	1	6	2	-	2	-	-	-	-	3	1	-	-	-
44	1	-	-	1	9	-	-	-	-	1	-	-	1	-	-	-	-
49	-	-	-	-	3	3	-	3	-	-	1	-	2	-	1	6	-
53	-	-	-	-	1	-	-	27	-	-	-	-	-	3	1	-	-
58	-	-	-	-	1	-	-	122	-	-	-	-	1	-	5	-	-
63	-	-	-	1	3	3	-	-	-	1	-	-	-	-	-	-	-
68	-	-	3	-	7	1	-	-	-	-	1	1	1	-	-	-	-
73	-	-	-	-	16	1	-	-	-	-	-	-	-	-	-	-	-
78	-	-	-	-	6	-	-	-	-	-	-	-	3	-	-	-	-
84	-	1	1	1	3	1	-	-	-	-	-	1	-	-	-	-	-
89	-	-	-	1	9	1	-	-	-	-	-	-	-	-	-	-	-
94	-	-	-	-	8	3	-	-	-	-	-	1	-	-	-	-	-
99	-	-	1	-	3	-	-	39	-	-	-	-	4	1	-	-	-
104	-	1	1	1	5	-	-	-	-	-	-	-	-	2	-	-	-
109	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
114	-	-	-	-	2	1	-	-	-	-	-	-	2	-	-	-	-
119	-	-	1	-	3	-	-	-	-	-	1	-	1	1	6	-	-
124	-	-	-	1	9	2	-	-	-	-	-	1	3	-	-	-	1
129	-	1	3	1	6	-	-	-	-	2	-	-	-	-	-	-	-
134	-	-	2	1	2	-	-	-	-	-	-	-	-	1	1	-	-
139	-	-	-	-	3	-	-	-	-	1	-	-	2	-	-	-	-
144	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	-
149	-	-	1	-	5	1	-	-	-	-	-	-	-	-	-	-	-
154	-	-	-	-	13	4	-	1	-	-	-	2	-	2	-	-	-
159	-	-	-	1	4	1	-	55	-	8	-	2	2	-	-	-	-

Table 87. (Continued)

Depth in cm	LABIATAE	SAXIFRAGACEAE	PORTULACAE	ERICACEAE	PRINULACEAE	ELEAGNACEAE	RUBIACEAE	CAPRIFOLIACEAE	EUPHORBIACEAE	<u>Ilex/Nemopanthus</u>	<u>Rhus</u>	<u>Urtica</u>	PYROLACEAE	<u>Vitis</u>	<u>Berberis</u>	GENTIANACEAE	GUTTIFERAE	JUNCACEAE	<u>Viola</u>	Undetermined, AP and NAP	NAP: raw sum, without <u>Lythrum</u>
Surface	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	28	94
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	124
6	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	10	180
11	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	7	170
16	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	164
21	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	7	147
25	1	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	12	141
29	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	10	105
34	-	-	-	-	4	-	-	-	-	2	-	-	-	-	-	-	-	-	-	6	214
39	-	-	-	-	-	9	-	-	-	1	-	-	-	-	-	-	-	-	-	3	182
44	-	-	-	-	-	-	-	-	-	1	-	3	-	-	-	-	-	-	-	4	187
49	-	-	-	-	1	17	-	-	-	1	-	-	-	-	-	-	1	-	-	18	185
53	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	4	102
58	-	-	-	2	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	2	85
63	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-	5	110
68	-	-	-	1	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	11	159
73	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	4	77
78	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	7	155
84	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	16	115
89	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	3	131
94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	136
99	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	3	10	130
104	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	2	-	-	3	129
109	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	4	159
114	-	-	-	-	-	-	-	1	-	2	-	1	-	1	-	-	-	-	-	12	138
119	-	-	-	3	-	-	1	-	-	-	-	-	-	-	1	2	-	-	-	5	136
124	2	-	-	-	-	-	-	-	-	1	-	1	4	-	-	-	-	-	-	26	243
129	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	12	110
134	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	133
139	-	1	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	5	123
144	-	-	-	-	-	-	-	-	-	2	-	-	1	-	1	-	-	-	-	16	143
149	2	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	13	140
154	-	-	1	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	7	154
159	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	6	130

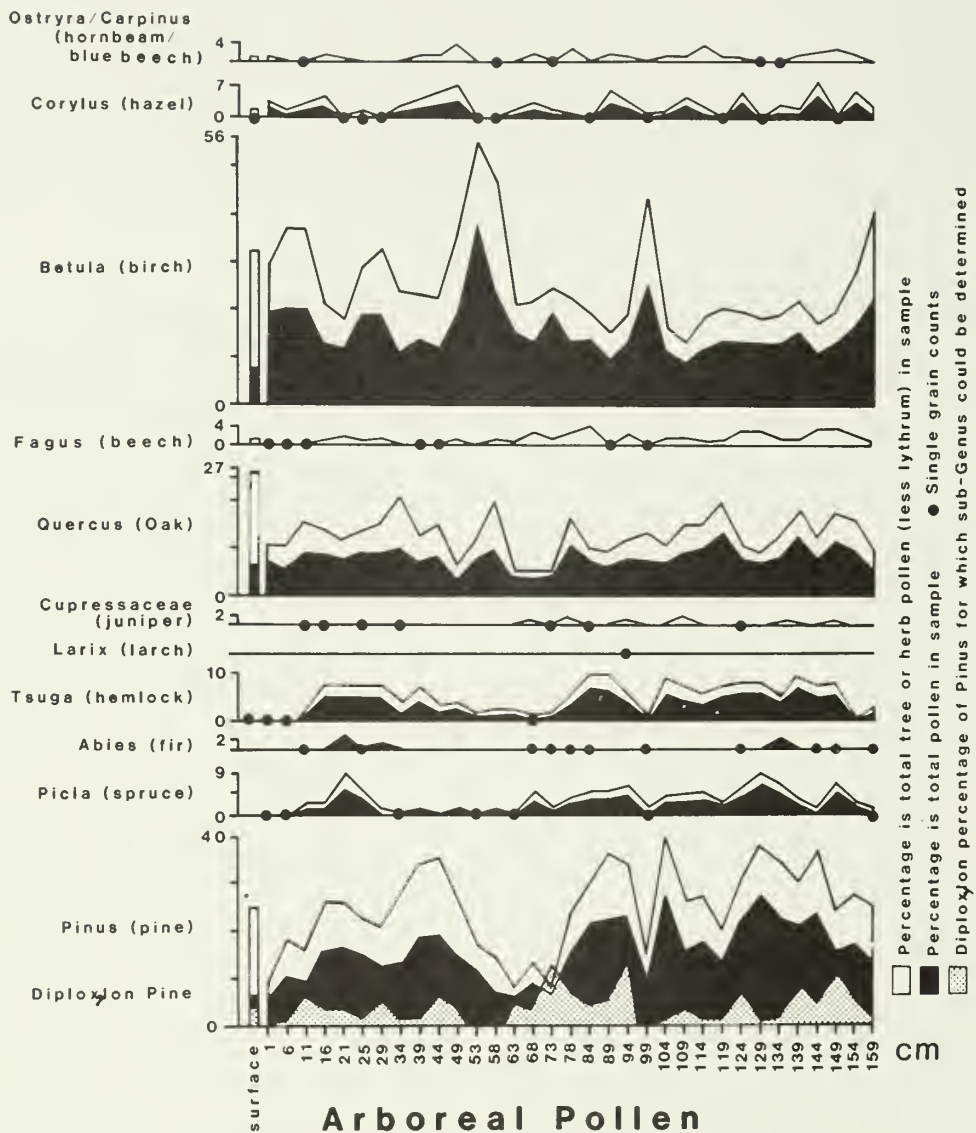
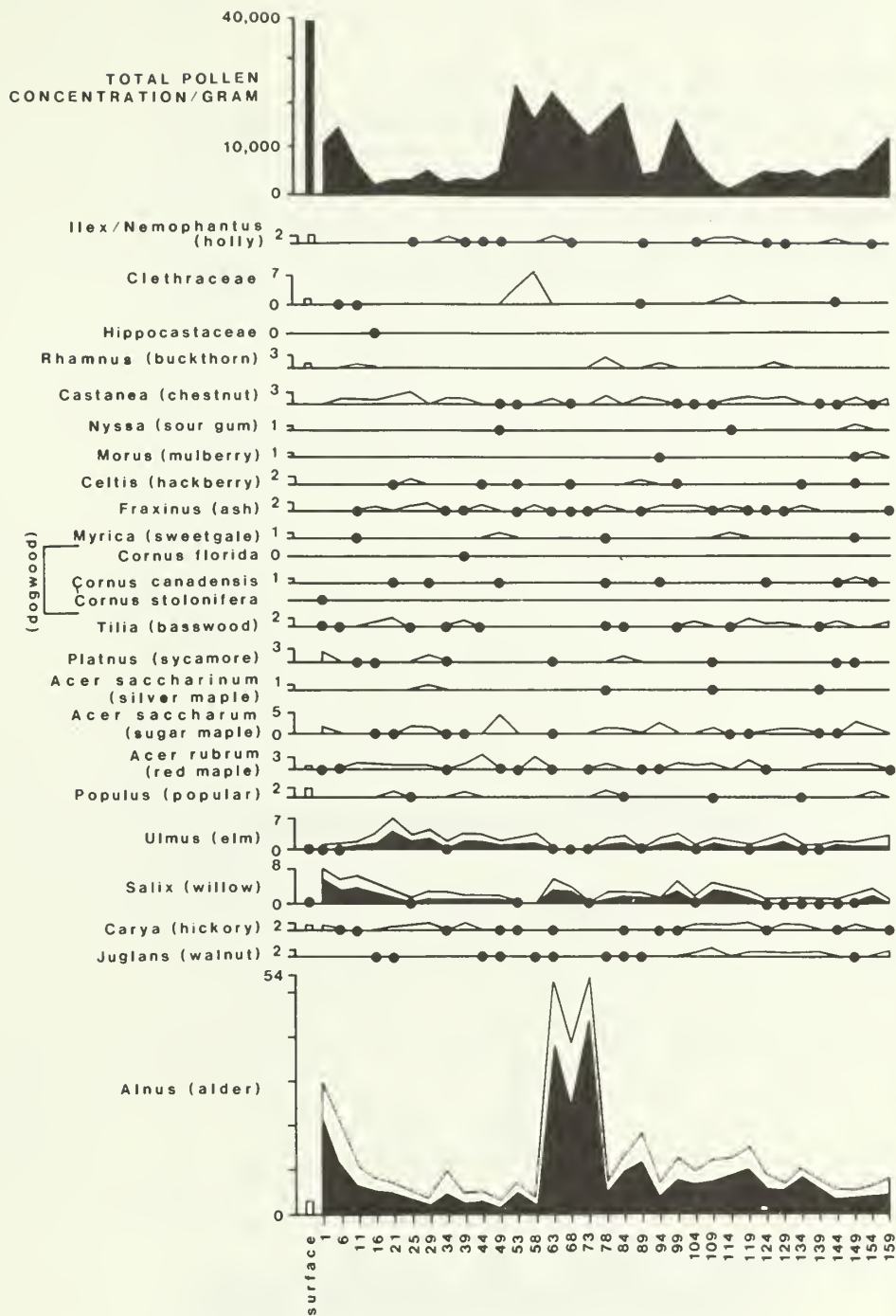
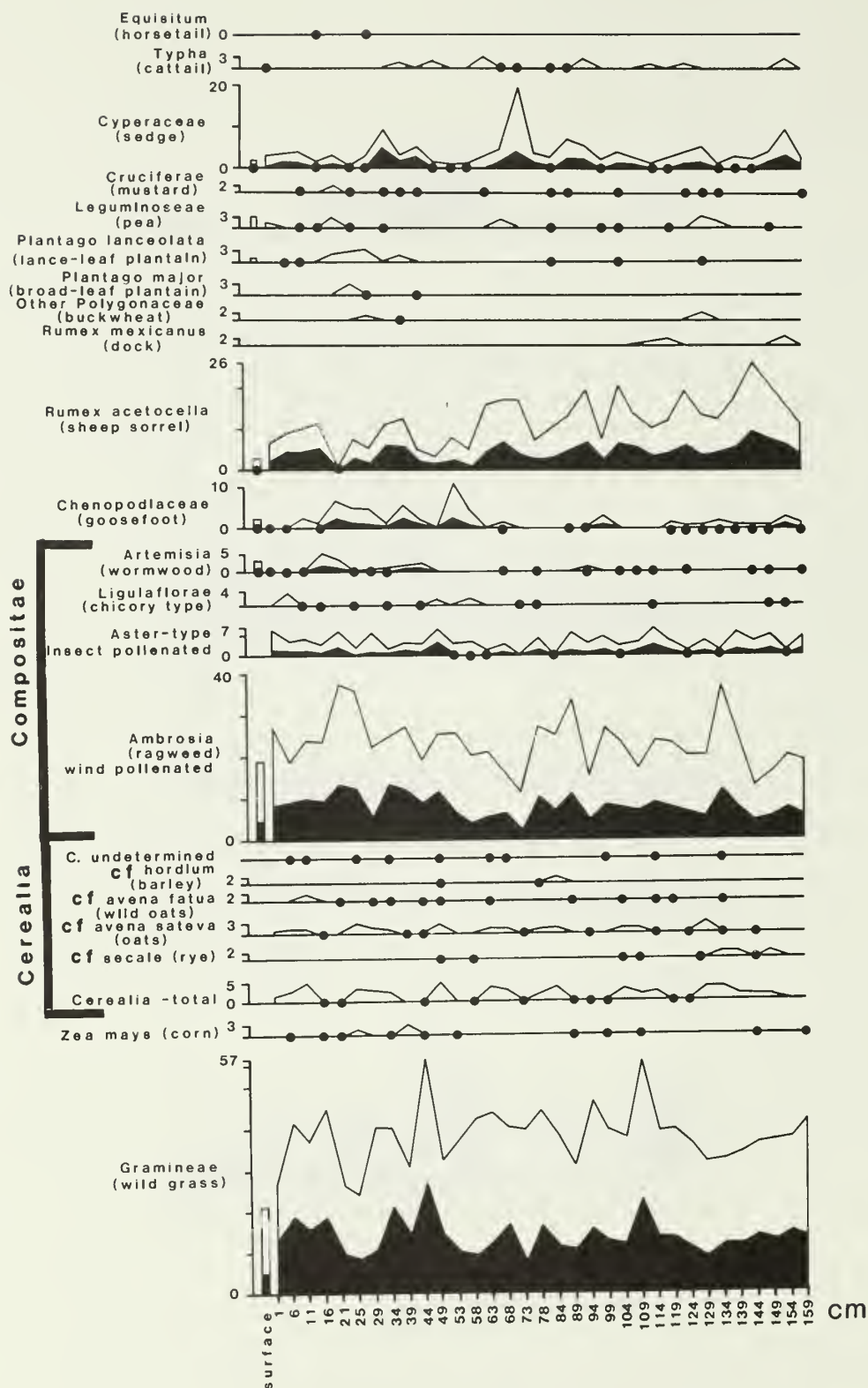


Figure 42. Arboreal Pollen Diagram.



### AP continued

Figure 42 (continued). Arboreal Pollen Diagram.



### Non-arboreal Pollen

Figure 43. Non-Arboreal Pollen Diagram.

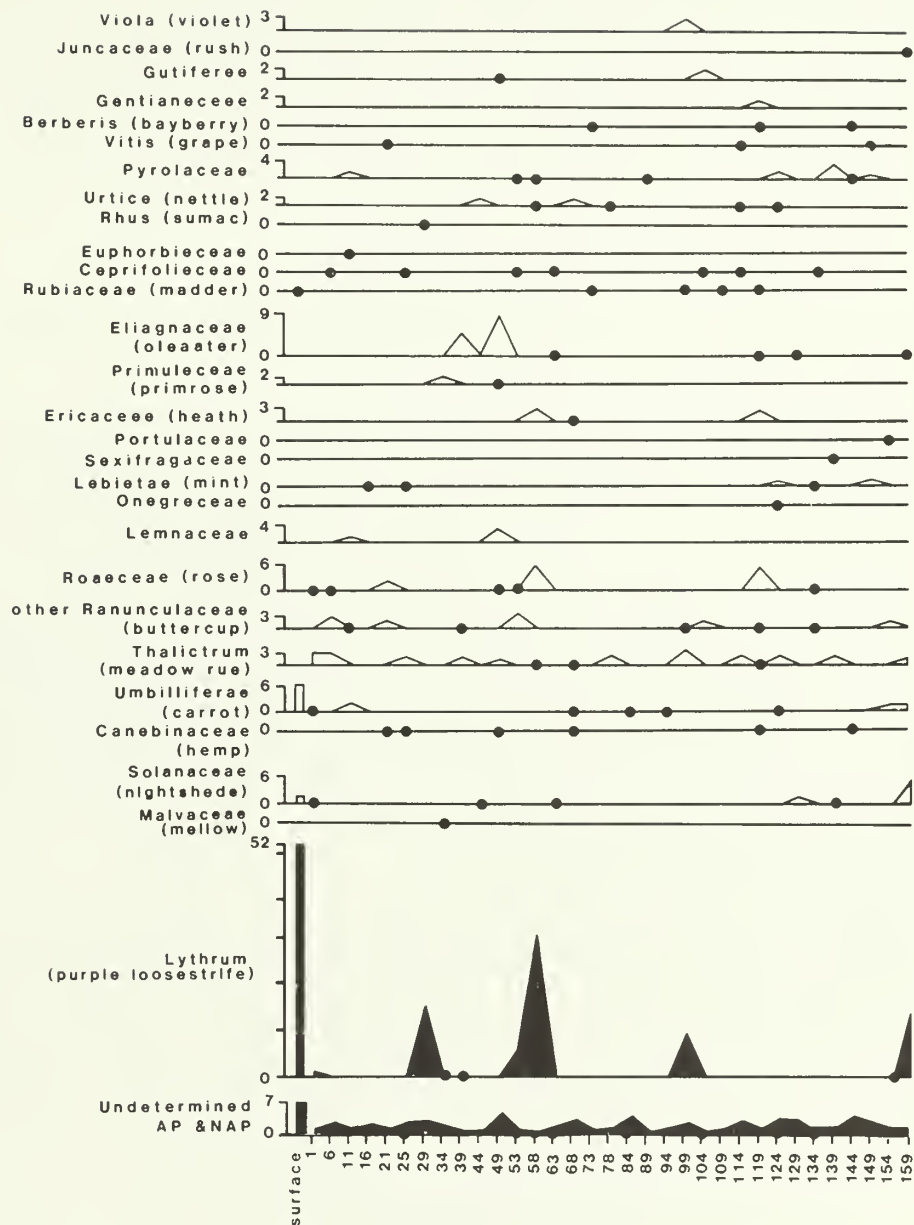


Figure 43 (continued). Non-Arboreal Pollen Diagram.

In studies of wind-transported pollen, most of the pollen emitted by discrete sources, arboreal and non-arboreal, has been found to fall to the ground within a few hundred meters of the parent plants (Raynor, Ogden, and Hayes 1968; Turner 1964). The small portion remaining airborne beyond that distance is well mixed with and not quantitatively distinguishable from that of other sources. In surface pollen transects this results in very high and quite irregular counts near the parent stands, and local pollen spectra containing many kinds of pollen. Minor vegetation types may be recognized. Regional pollen deposition, incorporating many of the same types as the local pollen rain, is characterized by lower, more uniform frequencies. Fewer kinds of pollen are present because most non-arboreal pollen is trapped near the ground by low wind speeds and the filtering effect of the stem space. Only major vegetation types, usually at the formation level, are recognizable (Janssen 1973).

Water transport apparently produces similar results. Pollen spectra drawn from laboratory flumes under experimental conditions are homogeneous (Brush and Brush 1972), while the pollen counts produced by episodic floods in arid-lands alluvium are very similar from place to place along the stream courses, in spite of significant differences in vegetation on the adjacent floodplains (Solomon, Blasing, and Solomon 1982). All communities transected by a stream are represented in the pollen spectrum ultimately deposited by a temperate zone stream, and this spectrum more accurately reflects regional vegetation than terrestrial surface samples collected along the stream catchment (Crowder and Cuddy 1973).

Among the Shattuck Farm pollen data, low amplitude and long term changes in arboreal and major non-arboreal types should reflect regional cultural patterns influencing vegetation, while short term high amplitude changes should reflect local events. Changes in the contributions of minor non-arboreal types should not be synchronous upstream, because they often reflect special situations, and thus they should be lost through mixing during transport. Any patterns which appear among such pollen types should indicate local conditions.

#### Documentary record of husbandry at Shattuck Farm

Documented agriculture on that portion of the kame terrace draining into Shattuck Farm Marsh begins with the purchase of 100 acres of privately held land, apparently where the Shattuck Farm buildings stood, by David Abbot in 1719. Adjacent land under Abbot's control totaled 576 acres by 1753 (Steinitz 1981:4). It has not been determined if Abbot's original holding had been previously cleared or farmed, but activities of this nature were evidently undertaken within the bend of the river encompassing his land as early as 1663. Clearance within Andover as a whole, first settled by Europeans in the 1640's, had progressed by the beginning of the eighteenth century to the point at which potential shipbuilders were enjoined to use no timber suitable for house construction and posts, and were permitted to cut only half a dozen trees if sufficient already-felled timber could not be procured (Bailey 1880:12-13,58).

. David Abbot's farming operation was apparently a fairly typical, if rather larger than most, New England combination of stock-raising and hay and grain farming. At his death in 1753 he owned 26 head of cattle, three horses, 15 sheep, three geese, and some pigs. The agricultural produce listed in the inventory of his estate, dated December 4th and possibly approximating the annual harvest, were 30 tons of hay, 40 bushels of oats, 80 bushels of rye, and 120 bushels of Indian corn (Steinitz 1981:6). At this time the farm was divided among the widow and the

two eldest sons, with a minor son, Jonathan, remaining with his mother on the third of the property surrounding the house site.

No corn or cereal grains were listed in the inventory of Jonathan Abbot's estate in 1817, and we do not know what sorts of crops he was raising. It is possible that the absence of produce in the inventory reflects the disastrous farming years of 1815-1817 (Steinitz 1981:7), but the inventory was taken in May, long after harvest, and thus the crops could have been already sold or consumed. Jonathan Abbot also possessed only nine head of cattle, four sheep, and one pig at his death (Steinitz 1981:8) but a reduction in the intensity of livestock raising is not necessarily indicated. Both his land holdings (ca. 100 acres of home farm and 67.5 acres of unattached woodland) and the number of his animals approximate 30% of those of his father. The proportions of tilled field, pasture, and woodlot on the home farm were apparently not recorded, and we have no data of this sort for the rest of Andover. Cleared land must have been extensive, however, as other Essex County communities had been reduced to supplementing their fuel wood with peat for a number of years (Russell 1976:303-304).

The Abbott farm was further divided in 1817, when Joseph Shattuck (a grandson of Jonathan Abbot) and Frederick Noyes purchased portions. Agricultural production data, beginning in mid-century, indicate that both men raised corn, oats, rye, hay, and potatoes as cash crops and were selling orchard produce of some kind (Steinitz 1981:13-16). Shattuck had increased his holdings sometime before 1850 and had at least 63 acres in meadow and pasture (Andover Assessors Valuation 1850). He was doing some commercial vegetable growing, including carrots and cabbages at least, and was purchasing some manure for fertilizer (J. Shattuck Account Book 1848-1861). Both Shattuck and Noyes kept cattle and sold butter, while Noyes had 15 sheep in addition. This pattern continued through the 1860's, except that sometime after 1850 Noyes discontinued sheep-raising. Shattuck had apparently been selling milk in the nearby mill town of Lawrence for several decades, and sometime between 1860 and 1870 he reoriented his dairy operation toward milk production, without increasing his herd, and intensified his market gardening activities (Steinitz 1981:14, Table 1).

Shattuck's sons, Lawrence businessmen who took over the farm in the 1870's, expanded the dairy and market gardening operations. They bought out Noyes and purchased other adjacent lands, almost tripled the size of the dairy herd, expanded the apple orchard to seven acres, and increased the reported income from market gardening by almost 3500% (Andover Assessors Valuations 1870-1910; Steinitz 1981: Tables 1,2). Large quantities of manure, mostly procured from Lawrence businesses employing draft animals, were applied to the fields annually and some commercial fertilizer was purchased (Shattuck Farm Account Books 1884-1907). Potatoes, cabbages, turnips, carrots, beets, onions, cauliflower, parsnips, squash, and corn, at least, were grown. Hay production continued and periodic purchases of grass seed indicate either crop rotation or the expansion of meadow and pasture during the 1880's and 1890's. The hay surplus available for sale increased around the turn of the twentieth century, but the growing of rye and oats was discontinued by 1880. Fodder corn continued to be grown and was supplemented with significant purchases of oats, corn, and other unidentified feed grains (Steinitz 1981: Tables 1,2; Shattuck Account Books 1884-1907). Market gardening continued on the property into the 1900's, but declined in intensity after ca. 1910, when farm activities were focused almost entirely on milk production under the management of a third generation of Shattucks (Steinitz 1981:32; Mahlstedt 1981:13).

Data on tree cover at the farm during the Shattuck/Noyes occupancy is not available, but apparently little existed, compared to the present day. The nineteenth and twentieth century photographs presented by Steinitz (1981: Figs. 1,2,8,9,11,12) show a landscape bare except for ornamental plantings of maples along roads and a single clump of trees, including some conifers, in the background of a 1937 photograph of the west barn and silo. Most of the trees visible in Mahlstedt's recent photographs appear young (Mahlstedt 1981). Trees should have persisted along the river but the land was farmed to the edge in some places and the trees may have occurred in small clusters. One such stand, designated "Laurel Grove" on early maps, existed quite near the marsh in the 1880's (Steinitz 1981:26, Fig. 13).

#### Palynological record of husbandry at Shattuck Farm: dating

Sheep sorrel is present throughout the Shattuck Farm profile. This indicates that the sediments are entirely historic in origin, and deprives us of the anchor for our pollen sequence which would be provided by evidence for initial settlement. The artifacts upon which historic period archaeologists normally rely for dating are not present, and radiocarbon dating is not sufficiently precise for such recent deposits (Table 88). Varve-like layers comparable to those employed to date historic sediments in Ontario and Minnesota (McAndrews 1976; Swain 1973) are absent, and the pollen concentration data suggest that sedimentation rates are too irregular to effectively employ  $Pb^{210}$  (Pennington et al. 1973; Brugam 1976). The Shattuck Farm sequence will have to be internally dated by correlating changes in the pollen spectra with cultural or environmental events of known age. Variations in the chestnut, alder, sedge (Cyperaceae), cattail (Typha latifolia), wormwood, goosefoot, and sheep sorrel pollen contributions appear to have potential for this purpose.

Table 88. Radiocarbon Dates from Shattuck Farm Marsh, Andover, MA

<u>No.</u>	<u>Sample</u>	<u>Date</u>
GX-9004	Bark from -87 to -91 cm	20 $\pm$ 145 B.P.
GX-9005	Bark and wood from -139 to -146 cm	-110 $\pm$ 120 B.P.

The native chestnuts (Castanea dentata) of eastern North America were wiped out by a fungal disease between 1904 and 1950 (Anderson 1974). The dates for the arrival of this disease in any given area are established within fairly narrow limits and the decline of chestnut pollen in recent sediments has been widely used as a horizon marker in pollen studies (Solomon and Kroener 1971; Davis 1967). Anderson's data (1974: Fig. 1) indicate that the blight reached southern New England by 1920 and independent sources confirm its presence in southern Maine by 1930 (Davis 1967). The trees contributing pollen to the Shattuck Farm marsh should have been affected sometime between these dates. Chestnut pollen was absent from the Shattuck surface sample but was noted in modest amounts throughout the rest of the profile. There is slightly less chestnut pollen in the -1 cm sample than in those immediately below, heralding perhaps the ultimate decline of the type, but barring the upward movement of pollen by benthic organisms (Davis 1967), the Shattuck Farm pollen record terminates sometime in the third decade of the present century.

The conspicuous peak of alder pollen frequencies between -73 cm and -63 cm is too abrupt and prominent to reflect a regional event. This should indicate a local expansion in the population of the parent trees, removal of other trees so that the alder pollen contribution became more evident, or an interval during which conditions were propitious for increased pollen production by the existing population. The counts of other arboreal pollen types, to be discussed later, suggest that all of these factors are involved but only the environmental element is sufficiently supported by other pollen types and documentary records to be applicable to the dating problem. The increase in alder counts generally coincides with an interval in which sedge frequencies peak (-73 cm) and cattail pollen is more regularly represented (-94 cm to -63 cm). Ten to 31 cm of core are affected and a wet period of considerable duration may be indicated. The only lengthy interval of precipitation significantly above average which is evident in the available weather records (NOAA, Boston: 1946, 1982) fell between 1850 and 1878, and it is possible that our -63 cm sample was deposited during the eighth decade of the nineteenth century. Mean rainfall for the period from 1818 to 1849 and 1879-1983 was 40.83 inches per year, while mean rainfall for the period from 1850 to 1878 was 52.44 inches per year. The 1850 horizon would appear to fall somewhere between -94 cm and -73 cm, but a general increase in the alder pollen contribution begins rather deeper in the profile, ca. -119 cm, and the pollen frequencies of willow (*Salix* spp.), a moist habitat tree whose low and regular pollen counts suggest a regional source, rise in parallel. Willow drops off above -63 cm as alder declines, supporting our inference that this level marks the end of the wet phase. The sediments contemporaneous with the beginning of the mesic interval may, however, lie somewhat deeper in the profile than the herbaceous pollen types suggest.

Between -58 cm and -16 cm the pollen frequencies of the nitrophilous goose-foot and wormwood rise while those of sheep sorrel, which prefers poor soil, generally decline. This suggests an increase in soil fertility that, in this portion of the profile, is best attributed to the large quantities of manure which the Shattuck brothers applied to their vegetable fields between 1875 and 1910. The contemporaneous expansion of the manure-producing Shattuck dairy herd could also have been a contributing element. Direct fertilization is the most probable source. Dairy farming continued as a major occupation on the farm through 1975, while market gardening, and presumably fertilizer procurement, was deemphasized after about 1910. The wormwood/goosefoot vs. sheep sorrel trend is reversed at -16 cm.

Our identification of events dating ca. 1875 to 1910 in the -58 cm to -16 cm spectra permits us to reasonably resolve the conflict among our data concerning the depth at which the beginning of the 1850-1878 wet period is recorded in the pollen column. Forty two centimeters of sediments were deposited during the 35 years of intensive market gardening, for an average of 1.2 cm per year. The wet phase was 29 years long, and there were 56 cm of core between the initial rise of alder and willow at -119 cm and their decline above -63 cm. If -119 marks the beginning of the mesic interval, the sedimentation rate for this period would average 1.93 cm per year. This is rather more rapid than that of the market gardening era. Pollen concentrations in this portion of the profile are much higher than those of the later-dated interval, strongly suggesting that the sedimentation rate should have been much slower. This makes it improbable that -119 cm dates to 1850. The -94 cm to -73 cm placement suggested by the cattail and sedge counts would result in a sedimentation rate somewhere between 1.1 cm and .37 cm per year. Although far from exact, this is more consistent with the pollen concentration data and the 1850 sediments probably lie somewhere within that core segment.

### Cultural record

Our chain of circumstantial evidence has provided four dates: -1 cm = ca. 1925, -16 cm = ca. 1910, -58 cm to -63 cm = ca. 1875, and -73 cm to -94 cm = ca. 1850. This sequence is intuitive but the presence of evidence from six pollen types for the concurrence of two unrelated events, the end of the 1850-1878 wet period and the beginning of heavy fertilizer applications on the farm, bolsters our confidence in its validity. The chronological data also indicate that most historic events did not produce broad changes in the pollen spectrum. Covariation among small groups of types does, however, suggest that four periods of somewhat different kinds of husbandry are recorded in the Shattuck Farm profile.

### Period I

The deepest of these historic intervals, encompassing the sediments from the bottom of the core up through ca. -129 cm, is characterized by decreasing grass pollen frequencies and increasing pine and spruce counts. Birch declines in the deepest four samples and then stabilizes, while hemlock, oak, and beech counts rise initially, but not sufficiently to establish a trend. A decline in *Diploxylon* pine as total pine rises suggests that the increase in pine is attributable to white pines. These relationships suggest secondary forest succession, late in such a sequence when the light-requiring birches and grasses were being shaded out on previously open spaces by conifers.

Sheep sorrel and ragweed constitute a second set of pollen types which appear to ca-vary in this section of the profile. The sheep sorrel contribution rises quite abruptly between the bottom of the profile and -144 cm, and then drops off somewhat but remains relatively high, if irregular, through -63 cm. The ragweed-type pollen contribution describes a mirror image of the sheep sorrel trend. It declines through -144 cm and then rises to remain high, if irregular, through the remainder of the profile. Its rise is accompanied by the appearance of wild oats (cf *Avena fatua*), a weedy species, in the counts. The increase in the sheep sorrel frequencies imply either an increase in the amount of land under cultivation or a decrease in the fertility of existing farmland during deposition of the deepest sediments, while the ragweed-type pollen frequencies indicate a subsequent expansion of either waste ground or ill-tended pasture and meadow. New England soils were never particularly rich, and soil depletion and expanding cultivation probably proceeded together. They cannot be confidently sorted out with the data available, but the appearance of cerealia and an increase in the sedimentation rate (indicated by a decline in pollen concentration per gram) as sheep sorrel peaks suggest that tillage was increasing. The grass pollen contribution was decreasing rather than increasing at this time, and it is probable that the rise in the ragweed-type counts is the product of an expanding population of parent plants on waste ground around fields and along paths. The slight decline in sheep sorrel above -144 cm is evidently a statistical response to the higher ragweed-type counts. Simultaneous trends toward reforestation and increased cultivation clearly conflict and it is probable that the arboreal and grass pollen frequencies reflect regional data contributed by Merrimack floods while the ragweed, sheep sorrel, and cerealia counts record the situation up slope on the kame terrace. The kinds of cereal pollen tentatively identified in this section of the profile, corn, cf rye, and cf oats, agree with the documentary record of the cereal grains grown on Shattuck Farm (Steinitz 1981:6, Table 1).

Three other pollen types, sedge (Cyperaceae), cattail (Typha), and purple loosestrife(Lythrum) provide data on the marsh itself. Sedges and cattails, anemophilous plants whose pollen rarely travels more than a few meters from its source (Durham 1951; Handle 1976), attest to moist conditions at the sampling site throughout the sequence, but the periodic appearance of significant amounts of purple loosestrife pollen suggests that standing water may not always have been present. Purple loosestrife occurs in marshes and low places where moisture accumulates, but it appears to like soils somewhat less wet than those preferred by cattails and most sedges. Its pollen is insect-transported and should be found in notable quantities only in the immediate vicinity of where the parent plants were growing. At Shattuck Farm purple loosestrife pollen appears only in highly organic layers, implying vegetation growing directly on the marsh. The domination of the surface sample by this type is the product of two successive summers of low rainfall, during which the marsh contained no standing water. Similar counts scattered through the profile, including the basal sample (-159 cm) should indicate similar situations. Unfortunately, disconnected frequencies like those at -159 cm, -99 cm, -58 cm, and -29 cm could reflect either local run-off or reduced flood-producing regional precipitation. These are for the most part single sample occurrences and could represent periods as short as one or two years. Many more short dry periods appear in the available weather records (NOAA Boston: 1949,1982) than we have loosestrife peaks, and these cannot be correlated to provide a date for the beginning of our sequence.

## Period II

The second of our apparent cultural pollen zones occupies the central portion of the profile, from ca.-124 cm up through roughly -63 cm. Two overlapping but distinguishable events are indicated. One of these, the 1850-1878 wet phase, has already been discussed. The second phenomenon is most clearly characterized by an increase in the grass pollen frequencies at -124 cm. Grass remains relatively high and irregular throughout the remainder of the profile, but a declining tendency may be indicated by the trend of the low counts above -58 cm (post-ca. 1875). Pine pollen counts also become very irregular above -129 cm. They display, on the average, a tendency toward lower pine pollen frequencies which culminates in a marked depression of the pine pollen contribution between -89 cm and -44 cm. The spruce and hemlock frequencies are also much lower during this last interval. These changes are at least partially the statistical product of the local over-representation of alder and birch evident between -73 cm and -44cm, but a real decrease in the numbers of white pines appears to be indicated by the increase in the ratio of Diploxylon pine to total pine between -94 cm and -73 cm. A moderate general rise in the birch counts, provided the single sample peak at -99 cm is disregarded, appears at -84 cm and continues to the top of the profile. The modest increases in the alder and willow frequencies which parallel the rise in the grass counts have already been noted.

These shifts in the pollen spectra imply the replacement of conifers by birch, alders, willow, and grasses. The time scale permitted here seems too short for this to be a natural environmental process. Birch is a recognized pioneer, and alder has been observed to rise and decline in response to the cutting and regeneration of climax forest in slightly over a quarter of a century (Davis 1973:Fig. 8). Alder some species of which will pollinate within ten years after seeding (Davis 1973:146), is known to colonize moist valley bottoms in burned-off areas (Mathewes 1973:2102), and willow pollen is most prominent where forest is declining and abandoned farmland

is high in Solomon and Kroener's (1971:Figs. 8,9) New Jersey transect. In the Shattuck Farm instance it appears equally probable that the willow and alder counts, other than the -73 cm to -63 cm peak of the last type, are at least partially statistical enlargements of the pollen contributions of existing populations brought about by the reduction in the size of the conifer pollen source.

These less than perfectly defined trends suggest a number of disconnected cutting incidents too small in scale or too widely dispersed in time or space to leave a clear record among the arboreal pollen counts, but whose cumulative effect is an overall increase in the regional grass population that is subsequently slightly suppressed by second growth birches. There is no contemporaneous increase in the sheep sorrel or other weed contributions and erosion, as indicated by high pollen concentrations per gram, is depressed. Land clearance for cultivation is probably not indicated. We do not have assessors' data for the pre-1850 period, and it is possible that an unrecorded local conversion of woods and cultivated land to pasture occurred. This explanation seems inconsistent with later accounts, and it is unlikely that the agri-business oriented Shattuck brothers would have permitted populations of pioneer birches to persist on revenue-producing land. It is possible, if not probable, that the pine, grass, alder, and willow trends of Period II are artifacts of the widespread clearance and seeding to pasture of existing farmsteads recorded for the second quarter of the nineteenth century, and the subsequent abandonment of these pastures after mid-century (Russell 1976: 353,526-527).

Some change in local husbandry may be recorded. Oat (cf Avena sativa) counts do not vary from Period I, but rye (cf Secale spp.) counts decline somewhat and pollen tentatively identified as that of barley (cf Hordeum spp.), a crop not recorded at Shattuck Farm by Steinitz (1981), appears in a few samples.

### Period III

Our third apparent pollen zone encompasses the profile sediments between -58 cm and -16 cm. These were deposited, provided our dating scheme is valid, during the Shattuck brothers' management period of 1875-1910. Our interpretation that the increases in wormwood and chenopodium contributions and the average decline in sheep sorrel frequencies reflects the augmentation of manure applications to the vegetable fields during this interval has been presented. These changes could also reflect nitrogen enrichment of pasture soils by the droppings of the expanded dairy herd. The Shattuck brothers were occasionally buying grass seed (Shattuck Farm Account Books, 1884-1910) and contemporaneous increases in the pollen counts of probable pasture weeds such as lance-leaved plantain, broad-leaved plantain, and chicory-type Compositae, occur. These last counts should be associated with the expansion of the dairy operation, but the grass pollen frequencies themselves decline somewhat.

Corn also contributed to the pollen spectra more regularly during this interval than before and cerealia continued to be regularly represented, in spite of the indications that cultivation of the latter was discontinued before 1880 while somewhat less of the former was grown on the combined farms during the 1870-1890 period (Steinitz 1981: Tables 1,2). Only two pollen grains attributed to rye and one probable grain of barley pollen, possibly brought up by bottom-burrowing animals (Davis 1967), appear in this segment of the profile. The most probable source of the corn and cf oat pollen is the notable quantities of these grains

purchased for stock feed during this period (Shattuck Farm Account Books, 1884-1910). Much of the surface water fed to the marsh came from the general vicinity of the farm buildings, and the cereal pollen was probably transferred to the watershed via the manure of the dairy herd. It also appears most reasonable to assume that the plantain and chicory-type pollen is derived from mown hay fed to stock, rather than directly from pasture plants.

The extensive Shattuck apple orchards, zoophilous trees whose pollen cannot be reliably distinguished from the other members of the Rosaceae, are not recorded in the pollen spectra. Indications of market gardening are restricted to the indirect evidence for the application of fertilizer, a decrease in the pollen concentration per gram which implies greater soil disturbance, and the somewhat more regular appearance of one or two grains of pea family (Leguminosae) and mustard family (Cruciferae) pollen in the samples from this section of the sediment. This possible vegetable pollen, with the exception of one grain of vetch-type (*Vicia* spp.) could not be reliably identified to genus and could be derived from numerous weedy plants belonging to these two families. The crucifers among garden vegetables should have been harvested before anthesis and the legumes, whose pollen contribution continues into the next more shallow pollen period, could have been fodder plants. The pollen of both families could also reflect excess produce fed to the numerous kinds of livestock which Steinitz (1981: Table 2) lists among the income sources at Shattuck Farm. This pollen might even be derived from purchased manure.

Not all changes in the pollen spectra of our third historic pollen period are attributable to the activities of the Shattuck borthers. Most arboreal pollen types rise between -58 cm and -16 cm, largely because the statistical constraint imposed by the local over-representation of birch and alder in the upper part of Period II was released. A decline in the proportion of *Diploxylon* pine pollen to total pine pollen suggests, however, that an actual increase in the white pine population had taken place and birch frequencies continue to increase, apparently at the expense of the grasses. The regional trend toward reforestation of abandoned farms which followed the post-1850 decline of the sheep-raising industry (Russell 1976:461,527), recorded in the upper portion of Period II, is in evidence.

#### Period IV

The final cultural pollen zone at Shattuck Farm is short, ca. -11 cm to -1 cm, and is defined on the basis of negative evidence. The contributions of most non-arboreal pollen types remain much as before but sheep sorrel recovers while goosefoot and wormwood decline to their former levels of representation. Among the arboreal pollen types pine, spruce, and hemlock decline markedly while birch continues its upward trend and the alder and willow counts increase significantly. These spectra apparently date between ca. 1910 and ca. 1930, and two things seem to be indicated. The most apparent of these is the harvesting of the "old field" conifers generally recorded across New England during the first quarter of the twentieth century (Davis 1965:382) and the beginning, at least, of their replacement by deciduous trees. The second event is the shift away from market gardening, with its heavy applications of fertilizer, under the post-1910 management of Ned Shattuck (Steinitz 1918:28), which appears to be reflected in the rising sheep sorrel and declining wormwood and goosefoot counts. An increase in the pollen contribution per gram may also be the product of reduced erosion off the fields and into the marsh with declining cultivation.

## CRITIQUE OF THE METHOD

Shattuck Farm marsh is an atypical archaeological pollen study because neither material culture nor isotope-geochemical dates serve to connect the obviously culturally biased pollen spectra to the archaeological society which produced them. The palynological artifacts of husbandry are also not well connected to historic cultural processes in general because the responses of given plants to given kinds of human activities have not been clearly established. The result is a sort of intuitive, circular interpretation in which the probable habitat preferences of presumed anthropogenic taxa deduced from the botanical, historical, and palynological literature are applied to changes in the pollen record and then matched to the local history of husbandry. The fit between the pollen record and the documentary record provides both the dates and the justification for the basic assumption that the pollen contributions of designated taxa will predominately originate in certain agricultural habitats. With neither firm chronometric dates nor a consistent sedimentation rate, our confidence in this method relies on the agreement between the succession of events in the pollen and historical records. The end is used to justify the means, and in this particular case the agreement is good. Such a methodology is somewhat tenuous, but when dealing with historic era pollen records from outside datable archaeological matrices, it is about all any investigator is likely to have.

## HISTORIC HUSBANDRY IN NEW ENGLAND AND THE POTENTIAL OF PALYNOLOGY

The spread of European settlement in New England consumed several hundred years and was not a uniform process. The Shattuck Farm data suggest that historic episodes do not have the same impact on vegetation as long-term regional climatic events or major economic processes such as clear-cut lumbering in virgin forest. Most events will be recorded in two or three pollen types reflecting specific kinds of conditions. The history of husbandry at Shattuck Farm (Steinitz 1981) is in many respects a microcosm of the development of agriculture in New England as a whole, as synthesized by Russell (1976) and others. There were apparently patterns of husbandry which were successively applied as each new area was occupied, as well as broader cumulative trends in agriculture. Evidence for some of these appeared in the Shattuck Farm pollen spectra. These data, together with those available from the literature, should permit us to hypothesize the nature of the palynological evidence for the general evolution of European-style agriculture in New England.

### Initial settlements

Mid-fourteenth century native agriculture in the northeast has been identified on the basis of corn pollen and high purslane (Portulaca) counts. The earliest European settlements may not be distinguishable from native activities in the pollen record. Aboriginally cleared fields, already head-high in unidentified indigenous weeds, were largely utilized by colonists and the primary native crops, corn (Zea mays), beans (Phaseolus spp.) and squash and pumpkin (Cucurbita spp.) were adopted. Plows were not available until the 1630's, and native agricultural methods continued to be used (Russell 1976:11-43). Kitchen gardens flourished (Russell 1976:38,41) but the insect-dispersed pollen of most crops probably would not pass beyond the borders of the plots, even if the plants were allowed to reach the reproductive stage. The initial attempts to grow European cereal grains were not highly successful but the pollen contributions of these crops, and those of the first exotic weeds, should constitute the horizon markers dividing aboriginal and European

husbandry in the pollen record. The presence of ragweed pollen, from plants hypothetically introduced from the west (McAndrews 1976:2), differentiates European from native agriculture in Ontario, but there is evidence that plants producing this pollen type were already in pre-Contact New England (Brugam 1976:356). McAndrews' (1976) data refer to 1846-1851, when plow-type agriculture is documented by land patents, and the pollen of all exotic weeds (Plantago lanceolata, P. major, Melilotus and Echium vulgare) except sheep sorrel, Rumex acetosella, are confined to these and later sediments. Sheep sorrel pollen appears as early as 1820 (McAndrews 1976:1), suggesting the presence of "squatters", and this pollen type may prove to be the most reliable indicator of the intrusion of European agricultural practices.

It is even possible that native agriculture will not be distinguishable in most cases. Corn pollen does not travel well and might not, in the absence of sheetwash, reach a favorable preservation environment. Squash and pumpkins are insect pollinated, and the only known incidence of Cucurbita pollen from New England consists of a single grain from a historic Narragansett grave in Rhode Island (Kelso and Adams, unpublished data). Beans are autogamous and their pollen is rare even in prehistoric settlement matrices from arid lands. Native Americans did not clear land solely for agricultural purposes (Day 1953:334-340) and British data (Sims 1973:224-226) indicate that the pollen spectra of pre-agricultural vegetation disturbance in the Old World are, except for the absence of cerealia, qualitatively very similar to those of the Neolithic.

#### General farming stage

With the arrival of the plow, which destroys the rhizomes and roots of perennial weeds such as grass and plantain (Behre 1983:229), differences in the weed populations of cultivated fields and pastures should have appeared. Anthropogenic pollen spectra may more closely resemble those of Europe. For a century and a half after 1630, a basic pattern of husbandry was repeated from area to area as the population expanded into the hinterland.

Wheat, the most esteemed flour source, was important in early wills and inventories but did not fare well after the appearance of black stem-rust in the 1650's. It was apparently tried in each newly-settled area, but was followed by disease and soil depletion. Wheat remained, in large part, a frontier crop and corn and rye became the principal grains. Barley, for beer, and oats, for fodder, were minor crops (Russell 1976:41-42; McManis 1975:91-92,101). Cultivation in new lands followed the Indian practice of hilling corn between stumps and unburned logs with the hoe only. However, in established settlements several light tillings, throwing the soil toward the hill or row to cover the weeds, was the ideal practice. Pumpkins were planted in the grain fields to smother the weeds (Russell 1976:43, 135). Most farmers were apparently not very diligent. Weedy fields were the rule rather than the exception (Carman 1939:58), with cockles (apparently members of the Caryophyllaceae) particularly noted in wheat fields in the 1750's (Russell 1976:169).

The pollen diagram of an idealized initial clearance situation should be characterized by an abrupt drop in total arboreal pollen and an equally sudden rise in the non-arboreal sum (Figure 44a), as opposed to the more gradual change in the relationship of these groups of pollen types produced by the expansion of existing agricultural plots (Figure 44b). These events should occupy a relatively short span of time. They may not be recorded unless sedimentation rates at the

sampling locality were high, and clearance activity does not automatically indicate European-style agriculture.

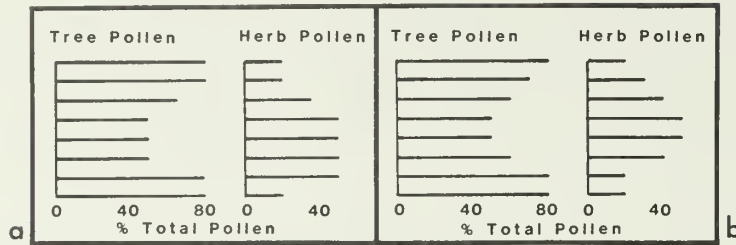


Figure 44. Schematic Percentage Pollen Diagrams. Idealized diagrams of (a) initial clearance, and (b) agricultural plot expansion activities (after Edwards 1979).

A model which could distinguish this period from pioneer agriculture employing native methods should join arboreal and non-arboreal evidence for land clearance to direct pollen evidence for agriculture. In theory the agricultural end of the equation should be established by the presence of European cereal pollen. With a proper catchment, a sufficiently rapid sedimentation rate at the sampling site, and a close sampling interval it may even be possible to recognize an initial wheat growing stage. The pollen resembling that of two cereal grasses, rye and barley, were more or less localized in the Shattuck Farm profile. To date, only corn (Davis 1969; van Zant et al. 1979) and oat pollen (Janssen 1967) have been reported from New World historic agricultural source areas. In New England, other than at Shattuck Farm, European cereal pollen has appeared only in urban, industrial, and grave matrices (Kelso and Schoss 1983; Kelso and Gorman, unpublished data; Kelso and Adams, unpublished data), and wheat has yet to be even tentatively identified.

Land clearance itself does not necessarily signify husbandry of any kind, as the timber trade was impinging upon North American forests simultaneously with the demand for agricultural space. In agricultural clearance most downed timber was burned rather than carried away, and in Europe some authors have suggested the proliferation of bracken fern (*Pteridium*), possessed of fire resistant rhizomes, as a marker for such activities (Dimbleby 1979). Experimental data (Iverson 1956: 40-41) and observations by modern foresters (Barrett 1980:44,52) indicate, however, that these plants respond equally to the habitat provided by felling without burning. In Europe, burning apparently has had an effect on herbaceous species similar to that of plowing (Behre 1983:229). In Iverson's (1956) experimental plots sedges and grasses, the primary pre-clearance herbs, flourished on unburned ground while burned ground was characterized by a whole new flora dominated by plantain and diverse members of the Compositae family. Davis' (1973) logging era data from Washington State fit this model, admittedly without comparative data from agricultural locations. However, in McAndrews' (1976) Ontario data, changes among the weedy pollen taxa differ from that predicted, with grass frequencies increasing during the 1846-1851 plow agriculture settlement period and plantain appearing with the advent of systematic pine lumbering. The non-arboreal pollen spectra of logging areas in Maine (Mavis 1969) and Minnesota (Bradbury and Waddington 1973)

seem little different from those of agricultural sections of southern New England (Davis 1969; Brugam 1979). It seems, then, that the burned vs. unburned ground portion of Iverson's (1956) model may not be applicable in New England. However, where the advent of local agriculture has been precisely dated, the pollen frequencies of the weedy taxa have risen in the spectra before the arboreal pollen frequencies declined (Brugam 1979:Figs. 3,4; McAndrews 1975:Fig.5). This feature may help distinguish lumbering from agricultural clearance.

Once opened to agriculture, areas were rarely abandoned immediately; in contrast, logging had an episodic nature. Unless followed by agriculture, lumbering may be evident in the relatively rapid regeneration of forest. Theoretically, stump-sprouting taxa should have an advantage in such situations and aspects of reforestation models, such as that generated by Ogden (1961) for Martha's Vineyard, might be applied to the recognition of pure lumbering situations. This will require pollen influx data, in which the actual amounts of pollen deposited per time unit are calculated, and a very close sampling interval.

Clearance data are also blurred by the non-synchronous nature of settlement, clearance, and reforestation episodes across New England. At Andover, New Hampshire, on the upper Merrimack, for instance, agricultural clearing began in the 1750's but the cutting of timber for its own sake, mast pines in this case, did not begin until 1839 and real commercial lumbering of pine, spruce, and hemlock dates to the 1850's and 1860's (Eastman 1910:273-274). Down drainage at Brookline, formerly Raby, the second growth forests had been cut by this time and the third growth was appearing (Parker 1941:1). Pollen evidence for the loss of local trees may be confused, if not obscured, by long-distance pollen transport while regional patterns may be masked by local pollen production in relative frequencies. The Barnstable Marsh (Butler 1959) and Linsley Pond (Brugam 1979) oak counts are cases in point. Clearance around a sampling site may proceed to the point where most of the arboreal pollen reflects regional rather than local patterns (Tauber 1965:33). There is yet no way of positively sorting out regional and local pollen contributions, but if sedimentation rates can be established, the calculation of pollen influx may alleviate this situation. The models presented in Figure 45 demonstrate one aspect of this. Figure 45a illustrates the relative frequencies in a situation in which the weed pollen is filtered out by vegetation (Tauber 1965: 34-40) intervening between the clearance locus and the sampling site. Statistical constraint cannot come into play, and since proportions rather than actual amounts of pollen are expressed, the real decline in the tree pollen contribution is not recorded. In the pollen influx model for the same situation, Figure 45b, weed pollen remains roughly the same but the actual decrease in the contributing tree population becomes evident.

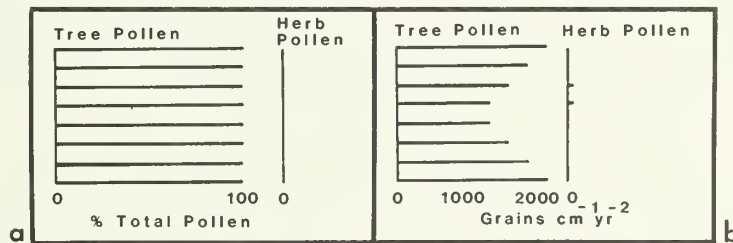


Figure 45. Schematic Pollen Diagram of a Cutting Incident with Filtering Vegetation between Clearance and Deposition Sites. a = relative frequencies; b = pollen influx frequencies (after Edwards 1979).

### The intensification of stock-raising

Severe soil depletion, the result of poor farming practices on already thin soils, was characteristic of colonial agriculture. Fertilizer was scarce except on the coast and rivers where fish and seaweed could be procured. The manure available went chiefly to corn and money crops, and fields often received only the droppings of livestock turned in to graze on the stubble after harvest (Russell 1976:128,239,311,313; McManis 1975:90). Much of this, even, was lost as animals were not well enclosed during the seventeenth and eighteenth centuries (Carman 1939:59). The actual amount of land under cultivation on any given farmstead was not large, ca. 20% where recorded (McManis 1975:93), but general farming, the apparently desired pattern, was not feasible in any given location for more than two generations. As the soil gave out much land was abandoned to pasturage, and stock-raising became at least equally important with cereal cultivation in the farm economy. These were augmented by the produce of considerable orchards, planted early in the occupation of each farm, and extensive kitchen gardens (Russell 1976:128-144,146,151; McManis 1975:93). In some locations tillage, per se, never really got started and stock-raising constituted the basis of the economy from the beginning. Oral traditions collected in the vicinity of Temple, New Hampshire, (F. Gorman, personal communication) indicate that the first settlers during the 1750's occupied the relatively open summits of low mountains because of the availability of grazing, and did not move down into the wooded lowlands until they procured imported grass seed in the 1780's.

Pasturage itself was, beyond the salt and river meadows, less than abundant and often of low quality. Even these proved disappointing as fodder, and both English grasses and clover (Trifolium) seed were imported and sown by the mid-1600's (McManis 1975:95; Russell 1976:129). The extent to which these were adopted is not known (McManis 1975:95), but it was apparently far from universal. The anonymous author of American Husbandry complained in 1775 that much pasturage was grazed forest (the equivalent of the European "hudewald") and that much of the livestock subsisted on shoots, weeds, and the stubble of mown cash crop hayfields (Chapman 1939:58-59). Crop rotation, which could have provided good pasturage, was not systematically applied, in spite of the good example provided by English practice (Russell 1976:26). Apparently the custom in the last half of the eighteenth century was to plant a series of crops (corn, barley, oats, buckwheat, peas, and turnips) interspersed with single years of plowed fallow, until the land was exhausted. It was then put into clover to recover as meadow for some years (Carman 1939:56). By the early nineteenth century it was considered good policy to rotate three years in crops and three years in a mixture of herdgrass (Phleum) and clover. Herdgrass requires a fairly rich soil but meadows were only rarely manured, except by droppings, and much of the produce was cut and carried away. In practice, the hay period was stretched out until the weeds took over and the hay crop would not pay for the cutting. The remedy generally applied at this point was to plow and plant corn, followed perhaps by potatoes, and then hay again. This situation and the poor feed it produced persisted at least into the 1850's (Russell 1976:128,239,311,391).

European pasture weeds came into the New World quite early, possibly with the hay supplies of imported livestock. Couch and knot grass (Agropyron spp.), shepherd's purse (Capsella bursa-pastoria), dandelion (Taraxacum officinale), nettle (Urticaceae), plantain (Plantago spp.), sorrel and dock (Rumex spp.), daisy (numerous insect pollinated Composites), mullein (Verbascum spp.) nightshade (Solanum spp.), and the probably native purslane (Portulaca) were listed as hayfield

nuisances by mid-1600's (Russell 1976:132; Byrne and McAndrews 1975). Buttercup (Ranunculus spp.), as well as daisies and dandelions, had advanced well inland by the 1750's, while charlock (Brassica spp. or Raphanus spp.), daisies, and thistles (Centaurea spp., Cirsium spp., and other zoophilous Composites) were singled out as problems in the 1850's (Russell 1976:169,391).

Ideally, the de-emphasis of cereal cultivation and shift toward stock-raising caused by soil depletion should be marked in a sample series by a rise in the sheep sorrel contribution, followed by a decline of that pollen type. There should be a contemporaneous rise in grass pollen and a subsequent increase in pollen attributable to the weeds species listed by Russell (1976:132,169,391), as grass fades out in the counts. Cereal pollen in general should decline, but that attributable to the feed crop oats may constitute a larger proportion of the sum in suitable catchments. The Shattuck Farm sediments are perhaps too late for such a sequence to be recorded. Enough types, however, respond as predicted there and at other localities to suggest that the major elements of this scenario may hold true in properly dated pollen matrices. Cases in point are the grass counts at the pasture-sited New England Glassworks and the salt marsh Barnstable locality, the correlation of high plantain counts with the grass pollen peak at Barnstable, the more regular appearance of plantain in the dairy farming period at Shattuck Farm, and the distribution of cereal grass types at Shattuck Farm.

The pollen contributions of most of the reported historic pasture weeds cannot be expected to follow the model predictable from documentary sources. The majority of these are zoophilous and their pollen, with the exception of the aster-type (daisies) and chicory-type (dandelion), have not appeared in pollen spectra in sufficient quantities for the interpretation of their distributions to be statistically reliable. These plants also occur in ruderal spaces with at least equal frequency, a circumstance not noted by the seventeenth, eighteenth, and nineteenth century observers, and in the Shattuck Farm profile only chicory-type appears to respond to changes in the economic orientation of the farm.

#### Development of specialized husbandry

The general farm centered around corn, hay, and livestock remained characteristic of New England agriculture through the nineteenth century. Most farms were bare subsistence operations, often subsidiary to some trade, business, or profession (Russell 1976:408-409). The situation was not, however, static. Local tendencies toward cash crop specialization, triggered by industrial and commercial developments or urban population growth, appeared during the mid-eighteenth century while regional shifts in focus began to be evident by 1800.

Local emphasis on specific crops such as broomcorn (Panicum miliaceum or Sorghum vulgare) in the Connecticut River Valley of Massachusetts, buckwheat (Fagopyrum sagittatum), flax (Linum usitatissimum), and tobacco (Nicotina tabacum) in the Connecticut segment of that valley, onions (Allium spp.) across southern New England, and potatoes (Solanum tuberosum) in southern Maine have been detailed, among numerous others, by Russell (1976:366-383). Evidence for these may not be preserved in the pollen record. Many of the chosen crops are insect-pollinated and will appear irregularly. Most have relatives among the weeds, and the pollen of the domesticated taxa will therefore not be recognizable in most cases. Broomcorn, for instance, emits normal size grass pollen, and given the present state of the art it is not feasible to separate the pollen of potatoes from that of numerous varieties of nightshade (Solanum spp.). Buckwheat and flax do produce

distinctive pollen and may be isolated but recognition of most other crops, where feasible, will depend upon the patterns in their counts.

The wild relatives of most of the crop plants listed by Russell (1976:366-383) would not contribute much pollen themselves, and a proliferation of a generalized pollen type that incorporates both domesticated and wild taxa might, at the right place and time, be confidently interpreted as agricultural evidence. Van Zant et al. (1979) used this approach to document hemp (Cannabis sativa) growing in Iowa. Similar evidence for the unsuccessful attempts to produce cordage material in New England (Russell 1976:142) will have to be differentiated from the pollen contributed by domesticated hops (Humulus lupulus). Godwin (1967) did so on the basis of pore morphology in his study of Cannabis growing in Roman England, but his criteria have not proven replicable elsewhere (van Zant et al. 1979:229).

Among regional trends, those toward market gardening, sheep-raising, and dairy farming need to be discussed. Market gardening began in a modest way in the mid-1600's and developed steadily over the next century and a half. By 1768 the seeds of at least 56 varieties of vegetables and herbs were available to growers (Russell 1976:145). Vegetable growing received a boost in the late eighteenth century from the expanding markets provided by growing cities, improvements in greenhousing and transportation, and the availability of large quantities of fertilizer generated by the urban draft animal population. Manure could be augmented with imported plaster of Paris by the late 1790's and by South American guano by the first quarter of the nineteenth century, but the wide application of commercial fertilizers in New England awaited the development of rock phosphates and other chemical compounds in the late 1860's. By 1890 New England applied more fertilizer per acre than any other part of the country. Not all this was used to grow vegetable crops, but by 1900 market gardening generated one third of all farm income in Connecticut and one fourth of that in Maine and Massachusetts. During these same post-Civil War years, corn and other cereal production fell drastically in the face of cheap, railroad-transported midwestern grain (Russell 1976:312,326,361,373,375,429,431,460).

The decline in cereal cultivation on New England farms should be recognizable in pollen spectra if the anemophilous rye was among the local crops and a feed-lot situation utilizing commercial grain, such as that at Shattuck Farm, was not contributing run-off to the deposition site. Market gardens and orchards fall into the specialized crop category, and the same methods and constraints apply. Indicator pollen types should be even more scarce because many vegetables, especially the root crops, are not allowed to reach the reproductive stage. Also, should concentrations of appropriate pollen appear in a sequence, individual crops will not be identifiable. The majority of the common European vegetables and herbs belong to the Leguminosae, Solanaceae, Cruciferae, Umbelliferae, and Labitae and the pollen of these cannot, for the most part, be differentiated beyond the family level. The utilization of large quantities of fertilizer appears to have been more characteristic of market gardening than of other kinds of agriculture, and the Shattuck Farm data indicate that this will be reflected in the pollen contributions of the nitrophilous wormwood and goosefoot and the nitrophobic sheep sorrel. This is not definitive in itself, but where supported by documentary evidence of significant frequencies of pollen from possible vegetable crops it will be applicable to the problem.

The documented impact of sheep-raising (in response to the development of the woolen mills) on the surviving New England woodlands, and the probable retardation of reforestation as a result of land preparation for this form of husbandry during the period from 1790-1850, has already been discussed. Pollen evidence for this development will closely resemble that reflecting area by area initial agricultural clearance and subsequent shift to livestock raising. It should, however, take place later in any given pollen sequence and the spectra should have a more regional aspect with more regular, lower amplitude changes and a cumulative effect of generally higher grass counts and a lowering of already depressed arboreal frequencies. This is, of course, an idealized view and land clearance for sheep-raising was neither simultaneous across New England nor all-pervasive. In the Shattuck Farm profile, where we believe we have identified this phenomenon, long-distance pollen transport and localized woodland regeneration blur the evidence, but these data suggest that one aspect of the pollen counts characteristic of such activities will be a statistical increase in the contributions of trees, willow and alder in this case, growing on sites not suitable for seeding to pasture.

Surplus butter and cheese were standard sources of supplementary income on most New England farms, but only southern Rhode Island could be identified as a distinct dairying district before 1800. From the 1790's on, the development of the dairy industry paralleled that of market gardening as the demand for milk, as well as milk products, expanded with the urban market. A steady increase in dairy herd size was recorded through the 1830's and 1840's, with a marked trend toward more and larger dairy operations from 1850 into the twentieth century (Russell 1976:160,243,249,356,494-497).

The former practice of dairy farming at any given sampling site should be recorded in the grass, plantain, and perhaps chicory-type pollen counts and will be indistinguishable from the earlier shift to general stock-raising. Less associated clearance might be expected and the build-up of nitrogen from the droppings of expanded herds might result in larger proportions of wormwood and goosefoot among the weed pollen spectra, but the recognition of dairy farming in any given sequence will turn upon the investigator's knowledge of the nature and sequence of agricultural events in his study area. This was certainly the case at Shattuck Farm.

The hypothetical pollen record of New England husbandry presented here does not cover all eventualities, nor can evidence for all of the described agricultural trends be expected at any given locality. Each site will have a unique history recorded in a novel pollen sequence. However, with the demise of agriculture in twentieth century New England, a complete chronicle should end as it began, dominated by the trees.

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REFERENCES CITED

Abbot, Abiel

1829 History of Andover from its Settlement to 1829. Flagg and Gould, Andover.

Ahler, Stanley A.

1971 Projectile Point Form and Function at Rodgers Shelter, Missouri. Research Series No.8. Missouri Archaeological Society, Columbia.

Alvord, D.C., M.H. Pease, Jr., and R.J. Fahey

1976 The Pre-Silurian Eugeosynclinal Sequence Bounded by the Bloody Bluff and Clinton-Newbury Faults, Concord, Billerica, and Westford Quadrangles, Massachusetts. In Geology of Southeastern New England, edited by Barry Cameron, pp. 315-333. Science Press, Princeton.

Anderson, S.T., and F. Bertelsen

1972 Scanning Electron Microscope Studies of Pollen of Cereals and other Grasses. Grana 12: 79-86.

Anderson, T.W.

1974 The Chestnut Pollen Decline as a Time Horizon in Lake Sediments in Eastern North America. Canadian Journal of Botany 11:678-685.

Andover, Massachusetts

1860-1910 Assessors Valuation of the Real and Personal Estate of the Town of Andover (1860,1870,1880,1890,1900,1910). Draper and Andover Press, Andover.

Angier, Bradford

1956 How to Stay Alive in the Woods. Collier-MacMillan, London.

Anthony, David W., Frederick M. Carty, and Linda A. Towle

1980 Prehistoric Survey. State Reconnaissance Survey, Massachusetts Historical Commission, Boston.

Arnold, Dean E.

1971 Ethnomineralogy of Ticul, Yucatan Potters: Etics and Emics. American Antiquity 36:20-40.

Bailey, Sarah Loring

1880 Historical Sketches of Andover, Massachusetts. Houghton Mifflin and Company, Boston.

Baker, Charles M.

1978 The Size Effect: an Explanation of Variability in Surface Artifact Assemblage Content. American Antiquity 43:288-293.

Barber, Russell J.

1979 Human Ecology and the Estuarine Ecosystem: Prehistoric Exploitation in the Merrimack Valley. Unpublished PhD dissertation, Department of Anthropology, Harvard University, Cambridge.

1982 The Wheeler's Site. Peabody Museum Monographs No.7. Peabody Museum of Archaeology and Ethnology, Cambridge, MA.

Barnes, Ruth C.

- 1980 Feature Analysis: a Neglected Tool in Archaeological Survey and Interpretation. Man in the Northeast 20:101-114.

Barrett, J.W.

- 1980 The Northeastern Region. In Regional Silviculture of the United States, edited by J.W. Barrett, pp. 25-66. Wiley-Interscience, New York.

Bell, Kenneth G., and Donald C. Alvord

- 1976 Pre-Silurian Stratigraphy of Northeastern Massachusetts. Geological Society of America Memoir No.148, pp.179-216. Geological Society of America, Washington D.C.

Behre, K.E.

- 1980 The Interpretation of Anthropogenic Indicators in Pollen Diagrams. Pollen et Spores 23(2):225-245.

Bennett, M.K.

- 1955 The Food Economy of the New England Indians, 1605-1675. The Journal of Political Economy 63:369-397.

Berlin, G.L., J.R. Ambler, R.H. Hevly, and G.G. Schaber

- 1977 Identification of a Sinagua Agricultural Field by Aerial Thermography, Soil Chemistry, Pollen/Plant Analysis and Archaeology. American Antiquity 42:588-600.

Bielski, Edward J.

- 1962 A Tyngsboro Pot. Bulletin of the Massachusetts Archaeological Society 23:34-36.

Bigelow, Henry B., and William Welsh

- 1925 Fishes of the Gulf of Maine. Bulletin of the U.S. Department of Fisheries Vol. 40. U.S. Government Printing Office, Washington D.C.

Billings, Marland P.

- 1956 The Geology of New Hampshire Part III: Bedrock Geology. New Hampshire Department of Resources and Economic Development, Concord NH.

Binford, Lewis R.

- 1980 Willow Smoke and Dog's Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. American Antiquity 45:4-20.

Bohrer, V.L.

- 1972 Paleoecology of the Hay Hollow Site. Fieldiana (Anthropology) 63:1-30.

Bonnichsen, Robson

- 1977 Models for Deriving Cultural Information from Stone Tools. National Museum of Man Mercury Series, Paper No.60. Archaeological Survey of Canada, Ottawa.

Borns, H.W., Jr.

- 1973 Late Wisconsin Fluctuations of the Laurentide Ice Sheet in Southern and Eastern New England. In The Wisconsin Stage, edited by R.F. Black, R.P. Goldthwait, and H.B. Willman, pp. 37-45. Geological Society of America Memoir No. 136, Washington D.C.

- Bourque, Bruce J.  
1973 Aboriginal Settlement and Subsistence on the Maine Coast. Man in the Northeast 6:3-20.
- Bouton, Nathaniel  
1856 The History of Concord from its First Grant in 1725, to the Organization of the City Government in 1853, with a History of the Ancient Penacooks. Benning W. Sanborn, Concord, NH.
- Bradbury, J.P., and J.B.C. Waddington  
1973 The Impact of European Settlement on Shawaga Lake, Northeastern Minnesota, USA. In Quaternary Plant Ecology, edited by H.B.J. Birks and R.G. West, PP. 289-307. Blackwell Scientific, Oxford.
- Bradford, William  
1966 Of Plymouth Plantation, 1620-1647. Edited by S.E. Morison. Alfred A. Knopf, New York.
- Bradley, James W.  
1983 Summary and Recommendations. In Archaeology of the Bostonian Hotel Site, edited by J.W. Bradley, N. DePaoli, N. Seasholes, P. McDowell, G.K. Kelso, and J. Schoss, pp. 77-83. Massachusetts Historical Commission Occasional Publications in Archaeology and History No. 2, Boston.
- Bradley, James W., Francis P. McManamon, Thomas F. Mahlstedt, and Ann L. Magennis  
1982 The Indian Neck Ossuary: a Preliminary Report. Bulletin of the Massachusetts Archaeological Society 43:47-59.
- Braun, David P.  
1974 Explanatory Models for the Evolution of Coastal Adaptation in Prehistoric New England. American Antiquity 39:582-596.
- 1977 Middle Woodland-(Early) Late Woodland Social Change in the Prehistoric Central Midwestern U.S. PhD dissertation, University of Michigan. University Microfilms, Ann Arbor.
- 1980 On the Appropriateness of the Woodland Concept in Northeastern Archaeology. In Proceedings of the Conference on Northeastern Archaeology, edited by James A. Moore, pp. 93-108. Research Reports No.19, Department of Anthropology, University of Massachusetts, Amherst.
- 1982 Radiographic Analysis of Temper in Ceramic Vessels: Goals and Initial Methods. Journal of Field Archaeology 9:183-192.
- 1983 Pots as Tools. In Archaeological Hammers and Theories, edited by James A. Moore and Arthur S. Keene, pp. 107-134. Academic Press, New York.
- Braun, E.L.  
1950 Deciduous Forests of Eastern North America. Blakiston Co., Philadelphia.
- Brewer, Jesse  
1961 A Cape Cod Canal Pot. Bulletin of the Massachusetts Archaeological Society 23:18-20.
- Bromley, S.W.  
1935 The Original Forest Types of Southern New England. Ecological Monographs 5:61-89.

- Brugam, R.B.  
1978 Pollen Indicators of Land-Use Change in Southern Connecticut.  
Quaternary Research 9:349-362.
- Brush, G.S., and L.M. Brush  
1972 Transport of Pollen in a Sediment Laden Channel: a Laboratory Study.  
American Journal of Science 272:359-381.
- Bullen, Ripley P.  
1949 Excavations in Northeastern Massachusetts. Papers of the R.S. Peabody  
Foundation for Archaeology Vol. 1 No.3, Andover.
- Butler, P.  
1959 Palynological Studies of Barnstable Marsh, Cape Cod, Massachusetts.  
Ecology 40:735-737.
- Byers, Douglas S.  
1944 A Possible Explanation of "Fire-Beds" or Hearths. Bulletin of the  
Massachusetts Archaeological Society 5(4):64-65.
- Byrne, R., and J.H. McAndrews  
1975 Pre-Columbian Purslane (Portulaca oleracea L.) in the New World.  
Nature 253:727-728.
- Caldwell, D.W., C. Koteff, and L.S. Hanson  
1978 Age of Deglaciation in the Lower Merrimack Valley, Southern New  
Hampshire. Geological Society of America Abstracts with Program 10(2):35.
- Carman, H.J. (editor)  
1939 American Husbandry. Edited version of the anonymous 1775 printing.  
Columbia University Press, New York.
- Carrol, C.F.  
1973 The Timber Economy of Puritan New England. Brown University Press,  
Providence.
- Carty, Frederick M.  
1983 Report of a Cache of Points Relating to the Susquehanna Tradition.  
Bulletin of the Massachusetts Archaeological Society 44:6-16.
- Castle, R.O.  
1958 Surficial Geology of the Lawrence Quadrangle. U.S. Geological Survey  
Geologic Quadrangle Map GQ-107, Washington D.C.
- Champlain, Samuel de  
1907 Voyages of Samuel de Champlain, 1604-1618, edited by W.L. Grant.  
Barnes and Noble, New York.
- Colby, W.G., M.A. Light, and T.A. Bertinuson  
1953 The Influence of Wind-Blown Material on the Soils of Massachusetts.  
Soil Science Society of America Proceedings 17:395-399.
- Cornwall, Ian W.  
1956 Bones for the Archaeologist. Phoenix House, London.

Corps of Engineers

- 1972 Flood Plain Information-Merrimack-Shawsheen, Spicket River, Lawrence, Methuen, Andover and North Andover, Massachusetts. Department of the Army, Northeast Division, Corps of Engineers, Waltham, MA.

Crowder, A.E., and D.G. Crowder

- 1973 Pollen in a Small River Basin: Wilton Creek, Ontario. In Quaternary Plant Ecology, edited by H.B.J. Birks and R.G. West, pp. 61-77. Blackwell Scientific, Oxford.

Cushing, E.J.

- 1964 Redeposited Pollen in Late-Wisconsin Pollen Spectra from East-Central Minnesota. American Journal of Science 262:1075-1088.

David, Nicholas

- 1972 On the Life Span of Pottery, Type Frequencies, and Archaeological Inference. American Antiquity 37:141-142.

Davis, Margaret B.

- 1965 Phytogeography and Palynology of the Northeastern United States. In The Quaternary of the United States, edited by H.E. Wright and D.G. Frey, pp. 377-401. Princeton University Press, Princeton.
- 1969 Climatic Changes in Southern Connecticut Recorded by Pollen Deposition at Rogers Lake. Ecology 50:409-422.
- 1973 Pollen Evidence for Changing Land Use Around the Shores of Lake Washington. Northwest Scientist 47:133-148.

Davis, O.K., D.A. Kolva, and P.J. Mehringer Jr.

- 1977 Pollen Analysis of Wildcat Lake, Whitman County, Washington: the Last 1000 Years. Northwest Science 51:13-30.

Davis, R.B.

- 1967 Pollen Studies of Near-Surface Sediments in Maine Lakes. In Quaternary Paleoecology, edited by E.J. Cushing and H.E. Wright, pp. 143-173. Yale University Press, New Haven.

Davis, R.B., T.E. Bradstreet, R. Stuckenrath Jr., and H.W. Borns Jr.

- 1975 Vegetation and Associated Environments During the Past 14,000 Years Near Moulton Pond, Maine. Quaternary Research 5:435-465.

Day, Gordon M.

- 1953 The Indian as an Ecological Factor in the Northeastern Forest. Ecology 34:329-346.
- 1978 Western Abenaki. In Northeast, edited by Bruce G. Trigger, pp. 148-159. Handbook of North American Indians, Vol. 15, William C. Sturtevant, general editor. Smithsonian Institution, Washington D.C.

DeBoer, Warren

- 1974 Ceramic Longevity and Archaeological Interpretation: an Example from the Upper Ucayali, Peru. American Antiquity 39:335-343.

Dennell, R.W.

- 1979 Prehistoric Diet and Nutrition: Some Food for Thought. World Archaeology 11:121-135.

Denny, C.S.

- 1982 Geomorphology of New England. U.S. Geological Survey Professional Paper 1179, Washington D.C.

Densmore, Frances

- 1928 Uses of Plants by the Chippewa Indians. Annual Report of the Bureau of American Ethnography 44:275-397. Washington D.C.

Department of Public Utilities

- 1976 Final Limited Environmental Impact Report on Proposed Tewksbury-Golden Hills 345 kV Transmission Line and Related Substations. Massachusetts Department of Public Utilities, Boston.

Dimbleby, G.W.

- 1978 Plants and Archaeology. 2nd ed. John Baker, London.

Dincauze, Dena F.

- 1974 An Introduction to Archaeology in the Greater Boston Area. Archaeology of Eastern North America 2:39-67.

- 1975 Ceramic Sherds from the Charles River Basin. Bulletin of the Archaeological Society of Connecticut 39:5-17.

- 1976 The Neville Site. Peabody Museum Monographs No. 4. Peabody Museum of Archaeology and Ethnology, Cambridge MA.

- 1981 Paleoenvironmental Reconstruction in the Northeast: the Art of Multidisciplinary Science. In Foundations of Northeastern Archaeology, edited by Dean R. Snow, pp. 51-96. Academic Press, New York.

Dincauze, Dena F. and R. Michael Gramly

- 1973 Powissett Rockshelter: Alternative Behavior Patterns in a Simple Situation. Pennsylvania Archaeologist 43:43-61.

Dincauze, Dena F. and Judith Meyer

- 1977 Prehistoric Resources in East-Central New England: a Preliminary Predictive Study. NPS Cultural Resource Management Studies, National Park Service, Department of Interior, Washington D.C.

Dincauze, Dena F. and M.T. Mulholland

- 1977 Early and Middle Archaic Site Distributions and Habitats in Southern New England. In Amerinds and their Paleoenvironments in Northeastern North America, edited by Walter S. Newman and Bert Salwen, pp. 439-456. Annals of the New York Academy of Sciences Vol. 288, New York.

Dodge, Karl S.

- 1962 The Seaver Farm Site. Bulletin of the Massachusetts Archaeological Society 23:24-28.

Dorgan, Maurice

- 1918 Lawrence Yesterday and Today. Dick and Trumbull, Lawrence, MA.

Durham, O.C.

- 1951 The Pollen Harvest. Economic Botany 5:211-254.

Eastman, J.R.

- 1910 History of the Town of Andover, New Hampshire: 1751-1906. Rumford Printing Company, Concord, NH.

Edwards, K.J.

- 1979 Palynological and Temporal Inference in the Context of Prehistory, with Special Reference to the Evidence from Lake and Peat Deposits. Journal of Archaeological Science 6:255-270.

Emerson, George B.

- 1846 A Report on the Trees and Shrubs Growing Naturally in the Forests of Massachusetts. Dutton and Wentworth, Boston.

Fairbanks, Kathryn

- 1980 The South-Orientation of Some Sites in the Northeast. In Widening Horizons, edited by Curtiss Hoffman, pp. 185-194. Trustees of the Massachusetts Archaeological Society, Attleboro, MA.

Fernald, M.L.

- 1970 Gray's Manual of Botany. 8th ed. Van Nostrand Reinhold Co., New York.

Fessenden, F.W., John Ayres, and S.L. Dean

- 1975 A Summary of the Geology of Eastern Massachusetts. New England Division, Corps of Engineers Planning Document.

Ford, Richard I.

- 1979 Gathering and Gardening: Trends and Consequences of Hopewell Subsistence Strategies. In Hopewell Archaeology: the Chillicothe Conference, edited by David S. Brose and N'omi Greber, pp. 234-238. The Kent State University Press, Kent, Ohio.

Foster, Donald W., Victoria B. Kenyon, and George P. Nicholas II

- 1981 Ancient Lifeways at the Smyth Site, NH 38-4. New Hampshire Archaeologist 22(2):1-91.

Foster, George M.

- 1960 Life-Expectancy of Utilitarian Pottery in Tzintzuntzan, Michoacan, Mexico. American Antiquity 25:606-609.

Fowells, H.A.

- 1965 The Silvics of Forest Trees. USDA Forest Service Handbook No. 271. United States Department of Agriculture, Washington D.C.

Fowler, William S.

- 1952 Ceramics of the "Early" Period. Bulletin of the Massachusetts Archaeological Society 13(3):29-32.
- 1963 Classification of Stone Implements of the Northeast. Bulletin of the Massachusetts Archaeological Society 25(1):1-29.
- 1965 Two Duxbury Pots. Bulletin of the Massachusetts Archaeological Society 26:30-32.

Fowler, William S.

- 1966a Ceremonial and Domestic Products of Aboriginal New England. Bulletin of the Massachusetts Archaeological Society 27(3) and 27(4).
- 1966b The Horne Hill Soapstone Quarry. Bulletin of the Massachusetts Archaeological Society 27(2):17-28.
- 1974 Two Indian Burials in Middleboro. Bulletin of the Massachusetts Archaeological Society 35(3-4):14-18.

Fuess, Claude M.

- 1959 Andover: Symbol of New England. The Andover Historical Society and the North Andover Historical Society, Andover, MA.

Fuller, Donald C. and Charles F. Hotz

- 1981 Soil Survey of Essex County, Massachusetts: Northern Part. U.S. Department of Agriculture Soil Conservation Service, in cooperation with the Massachusetts Agricultural Experiment Station, Amherst, MA.

Galinat, Walter C.

- 1971 The Evolution of Corn and Culture in North America. In Prehistoric Agriculture, edited by Stuart Struever, pp. 534-543. The Natural History Press, Garden City.

Godwin, H.

- 1967 Pollen- Analytic Evidence for the Cultivation of Cannabis in England. Review of Paleobotany and Palynology 4:71-80.

Goodlet, J.C.

- 1954 Vegetation Adjacent to the Border of the Wisconsin Drift in Potter County Pennsylvania. Harvard University Forestry Bulletin No.26. Harvard University, Cambridge.

Gookin, Daniel

- 1792 Historical Collections of the Indians of New England. Reprinted in 1972 by Arno Press, Inc. New York. Originally printed by Belknap and Hall, Boston.

Gore, Richard Z.

- 1976 Cataclastic and Plutonic Rocks within and West of the Clinton-Newbury Fault Zone, East Central Massachusetts. In Geology of Southeastern New England, edited by Barry Cameron, pp. 335-344. Science Press, Princeton, NJ.

Gould, Richard A., D.A. Koster, and A.H.L. Sontz

- 1971 The Lithic Assemblage of the Western Desert Aborigines of Australia. American Antiquity 36:149-169.

Greene, William L.

- 1961 Ceramic Pot from the Indian Hill Site. Bulletin of the Massachusetts Archaeological Society 22:42-46.

Greig, J.

- 1982 The Interpretation of Pollen Spectra from Urban Archaeological Deposits. In Environment and Archaeology in the Urban Context, edited by R.A. Hall and H.K. Kenyon, pp. 47-65. Council for British Archaeology Report No.43, London.

- Griscom, Ludlow  
1949 The Birds of Concord. Harvard University Press, Cambridge.
- Hadlock, Wendell S.  
1949 Three Contact Burials from Eastern Massachusetts. Bulletin of the Massachusetts Archaeological Society 10(3):63-72.
- Handel, S.N.  
1976 Restricted Pollen Flow of Two Woodland Herbs Determined by Neutron-Activation Analysis. Nature 260:422-423.
- Harriot, Thomas  
1972 A Briefe and True Report of the New Found Land of Virginia. Dover Publications, New York.
- Harris, Stuart K.  
1975 The Flora of Essex County, Massachusetts. Peabody Museum of Salem, Salem, MA.
- Haynes, H.W.  
1886 Localities of Quarries Worked by the Indians for their Stone Implements. Boston Society of Natural History Proceedings 2:333-336.
- Heidenreich, Conrad E.  
1978 Huron. In Northeast, edited by Bruce G. Trigger, pp. 368-388. Handbook of North American Indians, Vol. 15, William C. Sturtevant, general editor. Smithsonian Institution, Washington D.C.
- Hodder, Ian  
1979 Economic and Social Stress and Material Culture Patterning. American Antiquity 44:446-454.
- Hoffman, Arthur M.  
1942 A Stone Pavement at Andover, Massachusetts. Bulletin of the Massachusetts Archaeological Society 3(2):25-26.
- Holden, Raymond  
1958 The Merrimack. Rinehart and Co., New York.
- Iverson, J.  
1941 Land Occupation in Denmark's Stone Age. Danmarks Geologiske Undersøgelser 4(3):5-23.  
  
1956 Forest Clearance in the Stone Age. Scientific American 194:36-41.
- Janssen, C.R.  
1967 Stevens Pond: a Postglacial Pollen Diagram from a Small Typha Swamp in Northwestern Minnesota, Interpreted from Pollen Indicators and Surface Samples. Ecological Monographs 37(2):145-172.  
  
1973 Local and Regional Pollen Deposition. In Quaternary Plant Ecology, edited by H.B.J. Birks and R.G. West, pp. 31-42. Blackwell Scientific, London.
- Johnson, Allen J. and George H. Auth  
1951 Fuels and Combustion Handbook. McGraw Hill, New York.

Johnson, Edward

- 1910 Johnson's Wonder-Working Providence. Edited by J. Franklin Jameson. Charles Scribner's Sons, New York.

Johnson, Frederick

- 1940 The Indians of Andover. Appalachia 89:1-50.

Johnson, George K.

- 1962 Two Barnstable Pots. Bulletin of the Massachusetts Archaeological Society 23:45-47-

Jordan, Douglas F.

- 1975 Factors Affecting New England Archaeology. Man in the Northeast 10:71-74.

Josselyn, John

- 1674 An Account of Two Voyages to New England. Massachusetts Historical Society Collections, Series III, pp.211-354. (1833)

- 1972 New Englands Rarities Discovered. Reprinted by Massachusetts Historical Society, Boston. Originally published in London in 1672.

Kelso, Gerald K. and J. Schoss

- 1983 Exploratory Pollen Analysis of the Bostonian Hotel Site Sediments. In Archaeology of the Bostonian Hotel Site, edited by J.W. Bradley, N. DePaoli, N. Seasholes, P. McDowell, G.K.Kelso, and J. Shoss, pp. 67-76. Massachusetts Historical Commission Occasional Publications in Archaeology and History No.2, Boston.

Kelso, G.K. and K. Adams

- nd Pollen-Analytical Investigation of Seasonal Mortality and Mortuary Customs among the Historic Narragansett: RI-1000. Analysis in progress.

Kelso, G.K. and F.J.E. Gorman

- nd Pollen-Analytical Investigation of an Eighteenth Century Industrial Complex: the New England Glassworks, Temple, Hew Hampshire. Analysis in progress.

Kenyon, Victoria B.

- 1979 Analysis of New England Prehistoric Pottery: the Smyth Site. Ms. on file, Center for Materials Research in Archaeology and Ethnology, Massachusetts Institute of Technology, Cambridge.

- 1983 River Valleys and Human Interaction: a Critical Evaluation of Middle Woodland Ceramics in the Merrimack River Valley. Unpublished PhD dissertation, Department of Anthropology, Boston University, Boston.

Kenyon, Victoria B. and Patricia F. McDowell

- 1983 Environmental Setting of Merrimack Valley Prehistoric Sites. Man in the Northeast 25:7-23.

Kidder, A.V.

- 1921 Unpublished notes on file at the R.S. Peabody Foundation for Archaeology, Andover, MA.

King, J.E., W.L. Klippel, and R. Duffield

- 1975 Pollen Preservation and Archaeology in Eastern North America. American Antiquity 40:180-190.

Koteff, C.

- 1980 Deglaciation of the Nashua and Merrimack River Valleys, North-Central Massachusetts and South-Central New Hampshire. Geological Society of America Abstracts with Program 12(2):67.

Koteff, C. and F. Pessl Jr.

- 1981 Systematic Ice Retreat in New England. U.S. Geological Society Professional Paper 1179.

Koteff, C. and R.P. Volckmann

- 1973 Surficial Geological Map of the Pepperell Quadrangle, Middlesex County, Massachusetts and Hillsborough County, New Hampshire. U.S. Geological Survey Geologic Quadrangle Map GQ-1118.

Lalish, Beth G.

- 1979 The Petrography of Archaeological Materials in New Hampshire. Senior thesis, Department of Anthropology, University of New Hampshire.

Lange, E.

- 1975 The Development of Agriculture During the First Millenium A.D. Geol. Fören. Förh. 97:115-124.

Limp, W. Frederick, and Van A. Reidhead

- 1979 An Economic Evaluation of the Potential of Fish Utilization in Riverine Environments. American Antiquity 44:70-78.

Livingstone, D.A. and B.G.R. Livingstone

- 1958 Late-Glacial and Postglacial Vegetation from Gillis Lake in Richmond County, Cape Breton Island, Nova Scotia. American Journal of Science 256:341-359.

Luedtke, Barbara E.

- 1975 Final Report on the Archaeological and Paleobotanical Resources of Twelve Islands in Boston Harbor. Submitted to the Massachusetts Department of Natural Resources (now Department of Environmental Management).
- 1980a The Calf Island Site and the Late Prehistoric Period in Boston Harbor. Man in the Northeast 20:25-76.
- 1980b Survey of the University of Massachusetts Nantucket Field Station. In Widening Horizons, edited by Curtiss Hoffman, pp. 95-129. Trustees of the Massachusetts Archaeological Society, Attleboro, MA.
- 1982 Lithic Raw Materials and Social Systems. Paper presented at the Meetings of the Conference on New England Archaeology, Cambridge, MA.
- 1983 Preliminary Report on the Shattuck Farm Site. Man in the Northeast 25:65-74.

Mahlstedt, Thomas F.

- 1981 The Archaeological Survey of Shattuck Farm. In An Archaeological Survey and Documentary History of Shattuck Farm, Andover, Massachusetts, pp.1-74. Massschusetts Historical Commission Occasional Publications in Archaeology and History No.1, Boston.

- Marston, Philip M. and Myron Gordon  
1938 Notes on Fish and Early Fishing in the Merrimack River System. Biological Survey of the Merrimack Watershed, New Hampshire Fish and Game Department, Concord, NH.
- Martin, Paul S.  
1963 The Last 10,000 Years. University of Arizona Press, Tucson.
- Mathewes, R.W.  
1973 A Palynological Study of Postglacial Vegetation Changes in the University Research Forest, Southeastern British Columbia. Canadian Journal of Botany 51:2085-2103.
- Matson, Frederick R. (editor)  
1965 Ceramics and Man. Aldone, Chicago.
- McAndrews, J.H.  
1976 Fossil History of Man's Impact on the Canadian Flora: an Example from Southern Ontario. Bulletin of the Canadian Botanical Association, Supplement 9(1):1-6.
- McManamon, Francis P.  
1980 Middle Archaic Chipped Stone Variation: Collections Research and Hypothesis Testing. Occasional Publications in Northeastern Anthropology 7:39-58. Man in the Northeast, Inc.
- McManis, D.R.  
1975 Colonial New England: a Historical Geography. Oxford University Press, London.
- McPherron, Alan  
1967 The Juntunen Site and the Late Woodland Prehistory of the Upper Great Lakes Area. Anthropological Papers No. 30, Museum of Anthropology, University of Michigan, Ann Arbor.
- Meador, J.W.  
1869 The Merrimack River. R.B. Russell, Boston.
- Mehringer, P.J. Jr.  
1967 Pollen Analysis of the Tule Springs Area, Nevada. In Pleistocene Studies in Southern Nevada, edited by H.M. Wormington and D. Ellis, pp. 120-200. Nevada State Museum Anthropological Papers No. 13, Carson City, NV.
- Meyer, T.R., and Glenn W. Stewart  
1956 The Geology of New Hampshire Part III: Minerals and Mines. New Hampshire Department of Resources and Economic Development, Concord, NH.
- Mickelson, D.M., L. Clayton, D.S. Fullerton, and H.W. Borns  
1983 The Late Wisconsin Glacial Record of the Laurentide Ice Sheet in the United States. In Late Quaternary Environments of the United States, Volume 1, the Late Pleistocene, edited by H. Wright Jr., pp. 3-37. University of Minnesota Press, Minneapolis.
- Mitchell, Stewart (editor)  
1930 The Planter's Plea (author unknown). In The Founding of Massachusetts: a Selection from the Sources of the History of Settlement 1628-1631, pp. 139-201. Massachusetts Historical Society, Boston.

Molloy, Peter M.

- 1980 Nineteenth-Century Hydropower. Winterthur Portfolio 15(4):315-343.

Moore, James A. and Dolores Root

- 1979 Anadromous Fish, Stream Ranking and Settlement. In Ecological Anthropology of the Middle Connecticut River Valley, edited by Robert Paynter, pp. 27-44. Research Report No. 18, Department of Anthropology, University of Massachusetts, Amherst.

Moorehead, Warren King

- 1931 The Merrimack Archaeological Survey. Peabody Museum, Salem, MA.

Morison, E.F., and E.E. Morison

- 1976 New Hampshire: a Bicentennial History. W. Norton and Co., New York.

Morton, Thomas

- 1883 New English Canaan. Edited by Charles Francis Adams, Jr. The Prince Society, Boston.

Mourt

- 1963 A Journal of the Pilgrims at Plymouth: Mourt's Relation. Edited by Dwight B. Heath. Corinth Books, New York.

Mrozowski, Stephen

- 1980 Aboriginal Ceramics. In Burr's Hill, edited by Susan Gibson, pp. 84-87. Haffenreffer Museum, Brown University, Providence, RI.

Muenschler, W.C.

- 1955 Weeds. 2nd ed. The MacMillan Co., New York.

Mulholland, Mitchell T.

- 1979 Forest Succession and Human Population Change. In Ecological Anthropology of the Middle Connecticut River Valley, edited by Robert Paynter, pp. 45-56. Research Report No. 18, Department of Anthropology, University of Massachusetts, Amherst.

Munsell

- 1973 Munsell Soil Color Charts. Munsell Products, Baltimore, MD.

NOAA, National Oceanic and Atmospheric Administration

- 1946-1982 Local Climatological Data: Annual Summary of Comparative Data, Boston, Massachusetts. National Climatic Data Center, Asheville, NC.

Niering, W.A. and R.H. Goodwin

- 1962 Ecological Studies of the Connecticut Arboretum Natural Area I: Introduction and Survey of Vegetation Types. Ecology 43:41-54.

Ogden, J.G. III

- 1961 Forest History of Martha's Vineyard, Massachusetts I: Modern and Pre-Colonial Forests. American Midland Naturalist 66:417-430.

Parker, E.E.

- 1914 History of Brookline, Formerly Raby, Hillsborough County, New Hampshire. Privately published by the Town of Brookline, NH.

Peck, R.M.

- 1973 Pollen Budget Studies in a Small Yorkshire Catchment. In Quaternary Plant Ecology, edited by H.B.J. Birks and R.G. West, pp. 43-60. Blackwell Scientific, London.

Pennington, W.

- 1975 The Effect of Neolithic Man on the Environment in Northwest England: the Use of Absolute Pollen Diagrams. In The Effect of Man on the Landscape: the Highland Zone, edited by J.G. Evans, S. Limbrey, and H. Cleere, pp. 74-86. Council for British Archaeology Research Report No.11.

Pennington, W., R.S. Cambray, and E.M. Fisher

- 1973 Observations on Lake Sediments Using Fallout <sup>137</sup>Ce as a Tracer. Nature 242:324-326.

Perley, Sidney

- 1912 The Indian Land Titles of Essex County Massachusetts. Essex Book and Print Club, Salem, MA.

Petzold, Arthur

- 1963 The Indian Roger Site. Bulletin of the Massachusetts Archaeological Society 24:45-49.

Pilcher, J.R., A.G. Smith, G.W. Pearson, and A. Crowder

- 1971 Land Clearance in the Irish Neolithic: New Evidence and Interpretations. Science 172:560-562.

Platt, John R.

- 1964 Strong Inference. Science 146:347-353.

Plog, S.E.

- 1980 Stylistic Variation in Prehistoric Ceramics. Cambridge University Press, Cambridge.

Porter, Kenneth R.

- 1972 Herpetology. W. B. Saunders Co., Philadelphia.

Potzger, J.E., and R.C. Friesner

- 1948 Forests of the Past Along the Coasts of Southern Maine. Butler University Botanical Studies 8:178-203.

Prentice, Guy

- 1983 Cottage Industries: Concepts and Implications. Midcontinental Journal of Archaeology 8:17-48.

Price, Chester B.

- 1958 Historic Indian Trails of New Hampshire. New Hampshire Archaeologist 8:2-13.

Raup, H.M.

- 1937 Recent Changes of Climate and Vegetation in Southern New England and Adjacent New York. Harvard University Arnold Arboretum Journal 18:79-117.
- 1940 Old Field Forests of Southeastern New England. Harvard University Arnold Arboretum Journal 21:266-273.

Raup, H.M. and R.E. Carlson

- 1941 The History of Land Use in the Harvard Forest. Harvard Forestry Bulletin No. 20, Harvard University, Cambridge.

Raynor, G.S., E.C. Ogden, and J.V. Hayes

- 1968 Effect of a Local Source on Ragweed Pollen Concentrations from Background Sources. Journal of Allergy 41:217-225.
- 1974 Mesoscale Transport and Dispersion of Airborne Pollens. Journal of Applied Meteorology 13:87-95.

Ritchie, William A.

- 1969 The Archaeology of Martha's Vineyard. Natural History Press, Garden City NY.
- 1971 A Typology and Nomenclature for New York Projectile Points. Revised edition. New York State Museum and Science Service Bulletin No. 384, Albany, NY.
- 1980 The Archaeology of New York State. Revised edition. Harbor Hill Books, Harrison, NY.

Robbins, Maurice

- 1959 Some Indian Burials from Southeastern Massachusetts, Part 2: the Wapanucket Burials. Bulletin of the Massachusetts Archaeological Society 20(4):61-67.

Roberts, B.K., J. Turner, and P.F. Ward

- 1973 Recent Forest History and Land Use in Waredale, Northern England. In Quaternary Plant Ecology, edited by H.B.J. Birks and R.G. West, pp. 207-221. Blackwell Scientific, London.

Robertson, Ben P. and Linda B. Robertson

- 1978 The Generation of Locational Models in an Inductive Framework. In Conservation Archaeology in the Northeast: Toward a Research Orientation, edited by Arthur E. Spiess, pp. 27-36. Peabody Museum Bulletin No.3, Cambridge, MA.

Roper, Donna

- 1976 Lateral Displacement of Artifacts Due to Plowing. American Antiquity 41:372-375.

Roper, Stephen J.

- 1981 Architectural Analysis of the Surviving Buildings of the Shattuck Farm, Andover, Mass. In An Archaeological Survey and Documentary History of Shattuck Farm, Andover, Massachusetts. Massachusetts Historical Commission Occasional Publications in Archaeology and History No.1. Boston.

Russell, H.S.

- 1976 A Long, Deep Furrow: Three Centuries of Farming in New England. University Press of New England, Hanover, NH.

Rye, Owen S.

- 1976 Keeping Your Temper Under Control: Materials and the Manufacture of Papuan Pottery. Archaeology and Physical Anthropology in Oceania 11:106-137.
- 1981 Pottery Technology. Taraxacum Manual on Archaeology No. 4. Taraxacum, Washington D.C.

Salwen, Bert

- 1978 Indians of Southern New England and Long Island: Early Period. In Northeast, edited by Bruce G. Trigger, pp. 160-176. Handbook of North American Indians, Vol. 15, William C. Sturtevant, general editor. Smithsonian Institution, Washington D.C.

Schafer, J.P., and J.H. Hartshorn

- 1965 The Quaternary of New England. In The Quaternary of the United States, edited by H.E. Wright Jr. and D.G. Frey, pp. 113-128. Princeton University Press, Princeton, NJ.

Scothorne, Donald, and Nancy Scothorne

- 1971 A Ceramic Pot Recovery at Oak Island No. 2. Bulletin of the Massachusetts Archaeological Society 32(3,4):19-22.

Sears, John H.

- 1905 The Physical Geography, Geology, Mineralogy and Paleontology of Essex County, Massachusetts. Essex Institute, Salem, MA.

Shattuck, J.

- 1848-1861 Account Book, 1848-1861. Andover Historical Society, Andover, MA.

Shattuck Farm Account Books

- 1884-1907 "Home Farm", "Noyes Farm", and "The Farms" Account Books. Andover Historical Society, Andover, MA.

Shaw, Leslie

- 1981 Phase I, Step 2 Archaeological Reconnaissance of the Proposed I-93/River Road Interchange, Andover, MA. Report submitted to Massachusetts Department of Public Works and Massachusetts Historical Commission, Boston.

Shepard, Anna O.

- 1956 Ceramics for the Archaeologist. Carnegie Institution, Washington D.C.

Shride, Andrew

- 1976 Stratigraphy and Correlation of the Newbury Volcanic Complex, Northeastern Massachusetts. GSA Memoir 148:147-177. Geological Society of America, Washington D.C.

Simmons, William S.

- 1970 Cautantowit's House. Brown University Press, Providence, RI.

Sims, R.E.

- 1973 The Anthropogenic Factor in East Anglian Vegetational History: an Approach Using A.P.F. Techniques. In Quaternary Plant Ecology, edited by H.B.J. Birks and R.G. West, pp. 223-236. Blackwell Scientific, London.

Smith, Benjamin L.

- 1940 A Report on a Fresh Water Shell Heap at Concord, Massachusetts. Bulletin of the Massachusetts Archaeological Society 1(3):14-26.

Smith, H.T.U., and H.J. Fraser

- 1935 Loess in the Vicinity of Boston, Massachusetts. American Journal of Science, Fifth Series, 30(175):16-32.

Smith, John

- 1910 Travels and Works of Captain John Smith. Edited by Edward Arber.  
Burt Franklin, Edinburgh.

Snow, Dean R.

- 1980 The Archaeology of New England. Academic Press, New York.

Solomon, A.M., T.J. Blasing, and J.A. Solomon

- 1982 Interpretation of Floodplain Pollen in Alluvial Sediments from an Arid Region. Quaternary Research 18:52-71.

Solomon, A.M., and D.F. Kroener

- 1971 Suburban Replacement of Rural Land Uses Reflected in the Pollen Rain of Northern New Jersey. New Jersey Academy of Science Bulletin 16:30-43.

Spurr, S.H.

- 1956 Forest Associations in the Harvard Forest. Ecological Monographs 26:245-262.

Steinitz, Michael

- 1981 Report on Documentary Research, Shattuck Farm. In An Archaeological Survey and Documentary History of the Shattuck Farm, Andover, MA, pp. 1-37. Massachusetts Historical Commission Occasional Publication in Archaeology and History No. 1, Boston.

Stimmel, Carole, Robert B. Heimann, and R.G.V. Hancock

- 1982 Indian Pottery from the Mississippi Valley: Coping with Bad Raw Materials. In Archaeological Ceramics, edited by Jacqueline S. Olin and Alan D. Franklin, pp. 219-228. Smithsonian Institution Press, Washington D.C.

Stockmarr, J.

- 1971 Tablets with Spores used in Absolute Pollen Analysis. Pollen et Spores 13:615-621.

Stolte, Lawrence

- 1981 The Forgotten Salmon of the Merrimack. Department of the Interior, U.S. Government Printing Office, Washington D.C.

Stone, B.D., and J.D. Peper

- 1982 Topographic Control of the Deglaciation of Eastern Massachusetts: Ice Lobation and the Marine Incursion. In Late Wisconsinan Glaciation of New England, edited by G.T. Larson and B.D. Stone, pp. 145-166. Kendall-Hunt Publishing Co., Dubuque IA.

Sturtevant, William C.

- 1975 Two 1761 Wigwams at Niantic, Connecticut. American Antiquity 40:437-444.

Talmage, Valerie A.

- 1982 Massachusetts General Laws and Human Burials. Bulletin of the Massachusetts Archaeological Society 43:60-65.

Tauber, H.

- 1965 Differential Pollen Dispersion and the Interpretation of Pollen Diagrams. Danmarks Geologiske Undersøgelser Ser. II 89:1-69.

Taylor, William B.

- 1982 The Taylor Farm Site. Bulletin of the Massachusetts Archaeological Society 43:40-46.

Thomas, Peter A.

- 1979 In the Maelstrom of Change: the Indian Trade and Cultural Process in the Middle Connecticut River Valley, 1635-1665. PhD dissertation, University of Massachusetts, Amherst. University Microfilms, Ann Arbor, MI.

Thorbahn, Peter F.

- 1982 The Prehistoric Settlement Systems of Southern New England, 8000 BC to 1500 AD: Final Report of the Interstate 495 Archaeological Data Recovery Program. Draft report submitted to Massachusetts Historical Commission.

Turner, J.

- 1964 Surface Sample Analysis from Ayreshire, Scotland. Pollen et Spores 6:583-592.

van Zant, K.L., T.Webb III., G.M. Peterson, and R.G. Baker

- 1979 Increased Cannabis/Humulus Pollen, an Indicator of European Agriculture in Iowa. Palynology 3:227-233.

Vidal, Frederico S., Charles I. Shade, and Edward E. Hunt, Jr.

- 1950 Four Indian Burials at Hyannis. Bulletin of the Massachusetts Archaeological Society 12(1):8-10.

Viera, Donald J.

- 1962 A Kingston Pot. Bulletin of the Massachusetts Archaeological Society 23:32-34.

Vuorela, I.

- 1973 Relative Pollen Rain Around Cultivated Fields. Acta Botanica Fennica 102(27):1-27.

Wadsworth, H.A.

- 1878 Quarter-Centennial History of Lawrence, Massachusetts. Hammon Reed, Lawrence, MA.

Westveldt, M. and Committee on Silviculture, New England Section, Society of American Foresters

- 1956 Natural Forest Vegetation Zones of New England. Journal of Forestry 54:332-338.

Whallon, Robert, Jr.

- 1968 Investigations of Late Prehistoric Social Organization in New York State. In New Perspectives in Archaeology, edited by Lewis R. Binford and Sally R. Binford, pp. 223-244. Aldine, Chicago.

Whiting, William W.

- 1949 A Pot from Nook Farm Camp Site, Plymouth, MA. Bulletin of the Massachusetts Archaeological Society 10(2):44-45.

Williams, Roger

- 1973 A Key into the Language of America. Edited by John J. Teunissen and Evelyn J. Hinz. Wayne State University Press, Detroit.

Winthrop, John

- 1908 Winthrop's Journal, History of New England, 1603-1649, Volume 1. Edited by J.K. Hosmer. Barnes and Noble, New York.

Wobst, H. Martin

- 1977 Stylistic Behavior and Information Exchange. In For the Director: Research Essays in Honor of J.B. Griffin, edited by Charles E. Cleland, pp. 317-342. Anthropological Papers No. 61, Museum of Anthropology, University of Michigan, Ann Arbor.

Wood, William

- 1977 New England's Prospect. Edited by Alden T. Vaughn. University of Massachusetts Press, Amherst, MA.

Wright, J.V.

- 1974 The Nodwell Site. National Museum of Man Mercury Series No. 22. National Museum of Canada, Ottawa.

Yarnell, Richard Asa

- 1964 Aboriginal Relationships Between Culture and Plant Life in the Upper Great Lakes Region. Anthropological Papers No. 23, Museum of Anthropology, University of Michigan, Ann Arbor.

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